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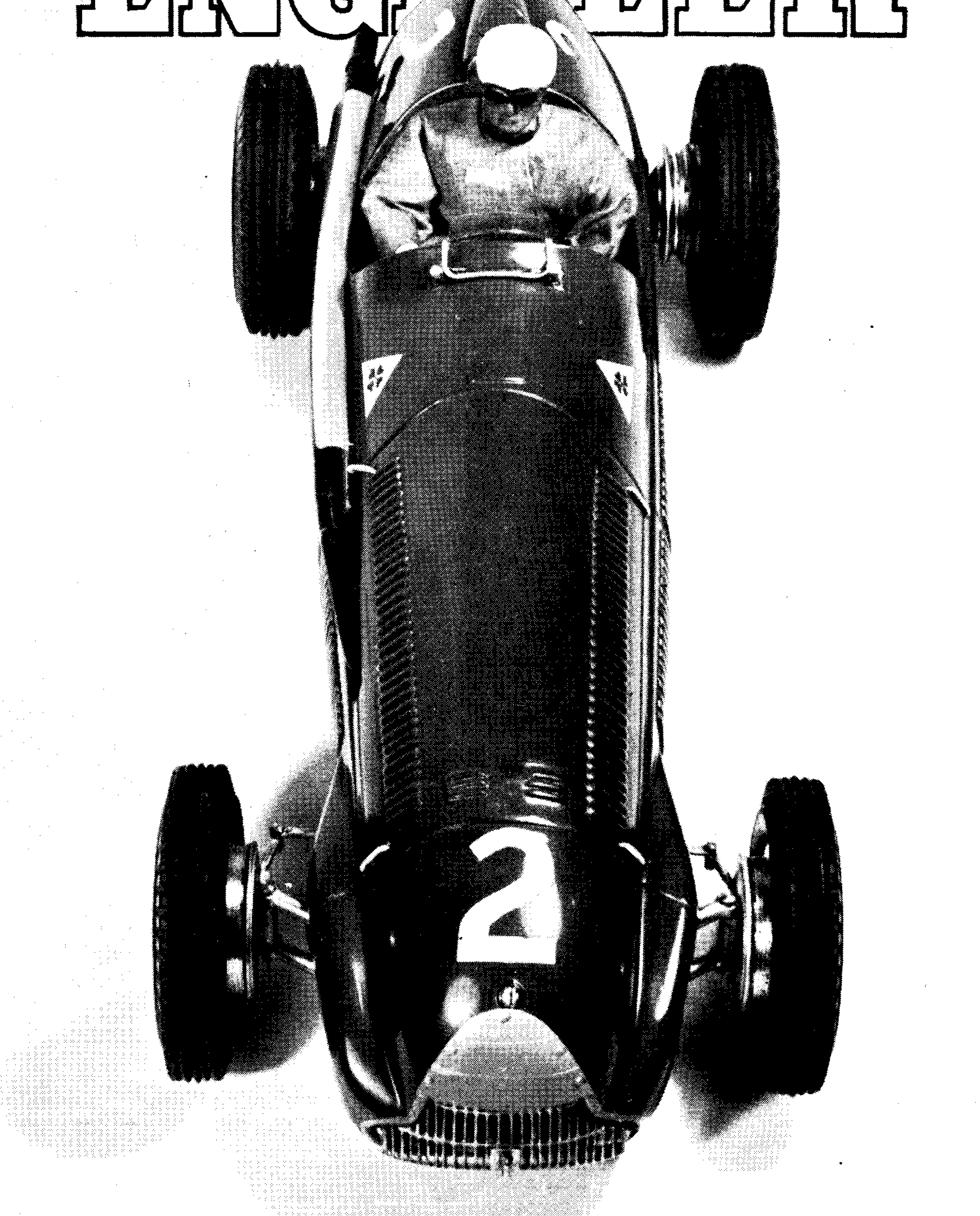
THE MODEL ENGINEER



The MODEL ENGINEER

PERCIVAL MARSHALL & CO. LTD., 23, GREAT QUEEN ST., LONDON, W.C.2

3RD JANUARY 1952 VOL 106 NO. 2641

SMOKE RINGS

Our Cover Picture

● WITH A miniature of a famous driver at the wheel, the "M.E." model Grand Prix car, the design and construction of which is now being described for our readers by Mr. Rex Hays, drives fairly and squarely on to our cover this week.

The famous 158 Alfa Romeo is known to most of us as the champion Grand Prix car, the car which usually goes out in front on the first lap of an event and stays to the bitter end. How appropriate then, that we should have chosen this Mark as the subject for our model.

We would remind readers that full working drawings are obtainable from our plans department now, and we shall be pleased to hear from anyone constructing the model who might have a query he would like answered.

Already there have been several "get togethers" on model Grand Prix tactics, and the Stoke club report steady progress. Be sure and send us details of *your* activities so that others may be enlightened and encouraged.

Looking Ahead

● WITH CHRISTMAS over, the model engineer begins to sort out his plans for the coming season when the longer days are with us once more. More than likely, there is something well in hand in the workshop; a locomotive, a miniature car or a power boat nearing completion for running at some outdoor function. This sort of thing is to be found in most of the home workshops everywhere at this time of year, and many a workshop owner is wondering whether the job in hand will be ready in time to run it before the coming summer, which now seems so far away (!), has gone.

The realisation of our pipe-dreams, however, depends upon one or two essentials which must not be forgotten, or neglected *now*. The workshop itself requires heating so that work can proceed in comfort; so arrangements must be made to ensure that there is little likelihood of the heating system failing. Tools and equipment must be kept in good order to prevent loss of time that might otherwise be spent in getting on with the job. There is a lot to be said in favour of preparing a rough time-schedule, allotting so many hours, or evenings, to the various processes of making individual parts and their subsequent assembly. Planning of this kind is always worth while.

A careful note kept of the time spent on the making of a model is almost always likely to be useful later on, when starting another model; because, with its aid, one can make a more accurate estimate of the number of evenings which will have to be allotted to the workshop and how many will be free for attending meetings, taking the wife or lady friend out, or any other purpose.

Index for Volume 105

● WE REGRET that, once again, we were not able to provide a bound-in index for the volume (105) which was completed with the December 27th issue, but we will send a copy to any reader who makes a special application for it.

We would be obliged, therefore, if every reader who really requires a copy will advise us immediately, enclosing an envelope large enough to take the "M.E." flat, stamped with a *three-halfpenny* stamp and addressed to himself. His copy of the index will be forwarded to him as soon as it is available.

And That was That !

● THE FOLLOWING story has been sent us by a Cheshire reader, Mr. H. Wynn-Davies, and we pass it on in the hope that it will be new to most readers, as it was to us.

A certain ship had quite a long stay in one port, and the Second Engineer took the opportunity of opening up the main engine cylinders and valve chests for the purpose of adjusting the piston-rings, valve settings, etc.

On putting to sea again, all went smoothly while the ship was being manoeuvred through the docks ; but, on entering the river and getting a "Full ahead" ring on the telegraph, the Second, who was on watch, was startled by a loud clanking. Turning to the Fifth Engineer, who was keeping the stand-by watch, he said : "Nip round the engine and find out what's loose."

The Fifth came back and reported that he could *see* nothing to account for the noise, but he thought it was something inside the L.P. cylinder.

"Nonsense," replied the Second, "there can't be anything adrift in there, everything was pulled up tight. Here, you stand by the telegraph while I go and look."

"I think you're right," he said, on his return ; "It does sound as if it is inside the L.P. We'd better get the Chief down and see what he thinks. Nip up and call him."

The Chief was soon down, wanting to know what all the racket was. The Second told him his suspicions and suggested that the Chief should have a look round to see if he could spot the trouble.

Well, the Chief went carefully over the whole engine with a fine-tooth comb, so to speak ; but he came to the same conclusion as the others had done. "We'll have to stop," he said, and open up that cylinder. I'll inform the bridge that we've a spot of bother and ask them to drop the hook as soon as they can. When you get 'Finished with engines' on the telegraph, shut your main stop valves and get the L.P. cover ready for lifting ; then let me know and I'll come down and see you lift it." With that he left the engine room.

The Second turned to the Fifth and said, "As soon as we get 'Finished with engines,' nip up to the boiler tops and shut down the main stops, then come up to the cylinder tops and give me a hand ; we'll get that cover off *before* the Chief comes down."

The Fifth did as he was told and, between them, they got the cover nuts off in double quick time, hooked on the tackle, hove up the cover and had a look inside the cylinder. The piston was at the bottom of the stroke ; it was rather dark, so the Second lit a "Duck" lamp (a tin lamp with a loose, open wick, burning colza oil with a naked flame). Its flickering flame revealed a $\frac{7}{8}$-in. Whit. spanner lying on the piston crown, where the Second had left it after tightening up the junk-ring nuts !

"By Jove, 'Fiver'," he remarked, "it's a good job we opened this up before the Chief saw it. Put that spanner away in the store ; then we'll drop the cover back on and put a few nuts on, then you can run and tell him we're ready to lift."

This done, the Chief came down to find the Second removing the last nut from its stud. "All right," he said, "heave away on the tackle and we'll see what the trouble is." Off came the cover, he looked inside and there was the cause of all the clanking—the "Duck" lamp—still burning !

The Helpful Expert (?)

● FROM THE North London S.M.E. *News Sheet* we extract the following, in the belief that its implications will be familiar to readers everywhere :—

From time to time the society has the privilege of hearing a discourse by someone who can justifiably be acclaimed an expert. Sometimes the expert is just too good, then members who are also experts nod their heads wiseley and settle down to an academic evening. Possibly, some near-experts derive benefit, but what of the others ?

Let us take an imaginary talk on the process of hardening and tempering steel. "To harden a piece of carbon steel," says our expert, "heat it to a temperature of about 1,380 deg. Fahrenheit ; cast steel can be taken to 1,480 deg. Fahrenheit."

Someone enquires how the temperature may be known. "Use a pyrometer," says the lecturer, adding "It is possible to estimate temperature by colour—cherry red for carbon, and bright red for cast steel." "Thank you," says the novice, "that is very helpful."

The lecturer continues, "We will now deal with quenching mediums," and delves into the pros and cons of water, oils, waxes, mercury and air. After that, warming to his subject, he plunges head first into detailed treatment of unobtainable steels. When he has dissipated his subject and is cool enough to take note of the time, he hardens himself and says it is now too late to deal with tempering.

What a waste of time ! The lecturer knows so much about his subject that, unless the listeners are almost as well informed, conclusion will be reached that this specialised job is better left alone.

Had he brought a bunsen burner, a piece of silver-steel and "showed how," a greater service would have been rendered. Technical gymnastics may appeal to experts, but the average member wants basic principles.

Our friends of the N.L.S.M.E. may have their own ideas about all this ; but the obvious remedy is to know your lecturer.

*A MODEL GRAND PRIX RACING CAR

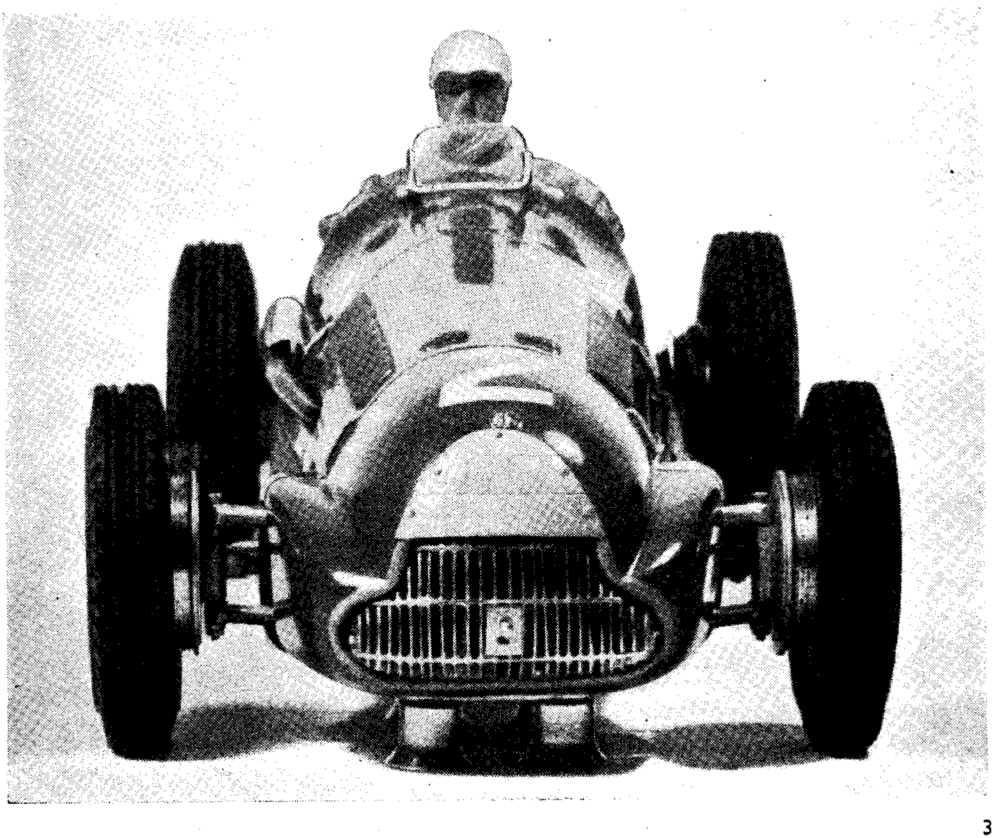
Rex Hays describes the construction of a miniature Alfa Romeo, Type 158, to $\frac{1}{12}$th scale

NOW for the powered chassis. During the forming of the body shell we saw to it that a shelf was provided on the underside, on to which the chassis would fit, and to which it would eventually be screwed and, therefore, the main plate of the chassis was formed before the shell was actually finished. This plate was made in dural and because we still had the artistic effect paramount in our minds, it was necessary to get the model on its wheels as soon as possible, so as to get the picture of the effect. Thus we come to the wheels and tyres.

The wheels, of course, were to be spoked and were turned from dural bar. They were turned in one piece comprising the wheel, the finned brake-drum and the hub. It was decided that the spoking would not be of the highly detailed and nippled variety, one reason being that it just wasn't necessary, and nothing would be lost by using the simpler method. Another reason was that it is a curious fact that the spokes on the Alfa Romeo wheels are usually fine and give the appearance of being rather fewer than they actually are. We, therefore, decided upon what I call the "wound and threaded" type of wheel, and to build these the rims were drilled, spaced by a dividing head on the lathe, and the hubs were grooved back and front, as deep as the bore would permit.

Before wiring the wheels the correct number of cooling holes were drilled round the wheel side of the brake-drums. This gives a very authentic appearance, and in addition helps to cool the clutch on the driving wheel. The wheels were then wired by threading plated wire through the

**Continued from page* 775, *Vol.* 105, "*M.E.*," *December* 13, 1951.



drilled rims round the grooves in the hub, and back through the rims again, and so on. When both the back set of spokes, and the front set were complete, these plated spokes set in the highly polished dural-wheel with the drilled brake-drum in the background were exceedingly effective. No painting is either necessary or desirable. The wheels on the real car are painted

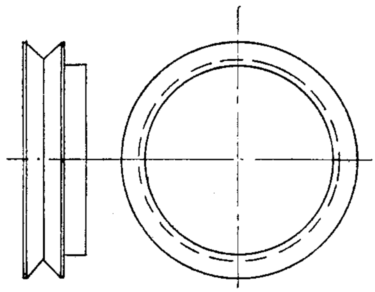


Fig. 6

silver, but on a model which will get a lot of handling, the paintwork, I feel, must be brought down to a minimum. Chipped paint always looks depressing. The winged locking-rings, which are dummy, were fashioned in aluminium, and pressed on to the hub against the front set of spokes, and so revolve with the wheel.

Now regarding the tyres; because time was an important factor, and as little delay as possible was the order of the day, we made a very daring experiment, which I must confess has proved highly successful. Two standard Dunlop 5.25 × 16 1/10th scale tyres, and two standard Dunlop 7.00 × 16 1/10th scale tyres were used, and the necessary section cut out of them to bring them down, when joined again, to the correct tyre sizes in 1/12th scale. They were then heavily treated with Bostic, and firmly wired,

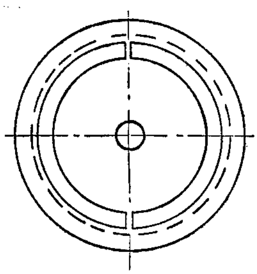


Fig. 7

the stranded steel wire being buried in the circumferential tread grooves.

At a later date, when the clutch and rear drive was complete, we removed the wire from one tyre, fitted it to a wheel, and started up the engine. At about maximum revs. the tyre expanded, and left the wheel, but it left the wheel as a complete tyre, the join being invisible, and as far as the strength was concerned, non-existent. Wired, the tyre remained on the wheel at the maximum speed of the car. I don't say that this experiment solves all tyre size troubles by any means, but it does provide an excellent means of keeping to scale with perfectly satisfactory functional properties, more especially as the speeds obtainable or desirable on closed circuits, such as the one for which this car is built, are not likely to exceed the point where the tyre would leave the rim, even unwired.

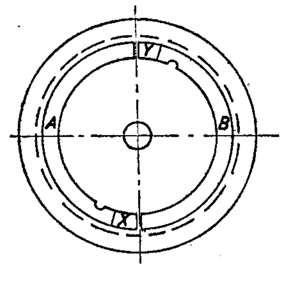


Fig. 8

Thus we have three wheels wired, complete with finned brake-drums; the fourth, i.e., the rear nearside wheel which is the driving wheel, has the brake-drum reduced considerably in width, and turned out on the inside to accommodate the clutch shoes. This clutch member incorporates on its outside circumference a grooved pulley wheel, which is used for starting. The clutch-cum-starter wheel is approximately the same width as the brake-drum on the other wheel and, at a glance, may easily be mistaken for a brake-drum, and does not appear in the least offensive to the general appearance of the model.

As we have made mention of the clutch, perhaps this might be the place to say more about it.

This "piece of triple purposes" flywheel-clutch and starter pulley is, in the first place,

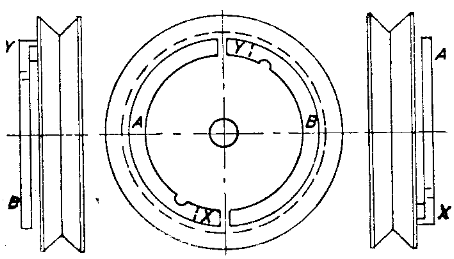


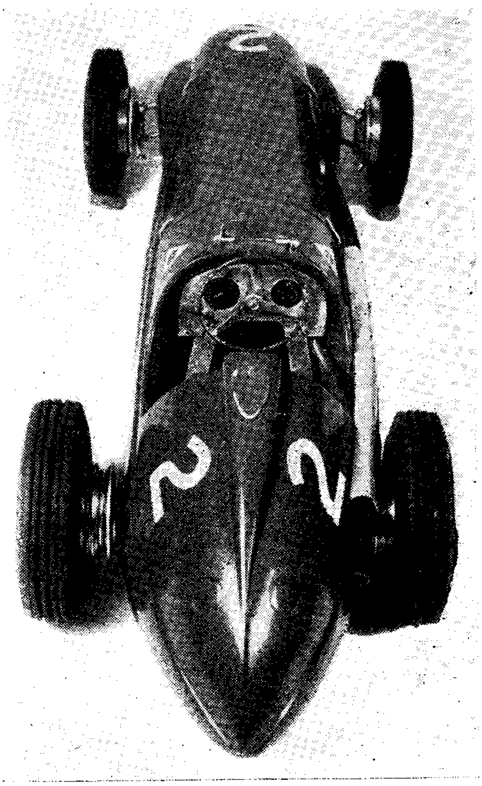
Fig. 9

turned from a piece of $1\frac{1}{4}$-in. brass bar. The design is best dealt with by illustration, I think. We see in Fig. 6 the pulley wheel turned leaving the blank from which the clutch shoes will be formed. This blank must be an easy fit into the turned out brake-drum—the clutch shoes are then formed by turning out the centre of the blank, thus leaving a ring of brass attached to a pulley wheel (Fig. 7). The forming of the shoes is accomplished by first sawing the ring across, thus leaving two separate half rings. These rings

are made into shoes by partly parting them from the pulley wheel with a hacksaw in the following manner: Cut each half circle completely away from the main body except for a piece of about $\frac{3}{16}$ in. on alternate ends of each half circle (Fig. 8). We now have two shoes "A" separated from the pulley wheel, except for a small area "X" and "B" separated, except for the small area "Y." So that these shoes will operate readily by centrifugal force, when the whole mechanism revolves at high revolutions, the shoes are weakened by cutting a slot out of them at the attached end of each, just clear of the attaching area. Fig. 9 shows an exaggerated sketch of the whole design. It is extremely ingenuous and foolproof in operation, and not really as complicated to make as it is to describe. It is important to remember that the leading edge of the shoes should be the portion fixed to the pulley leaving the trailing edge free. The illustration (Fig. 9) is for nearside drive—reverse for offside drive.

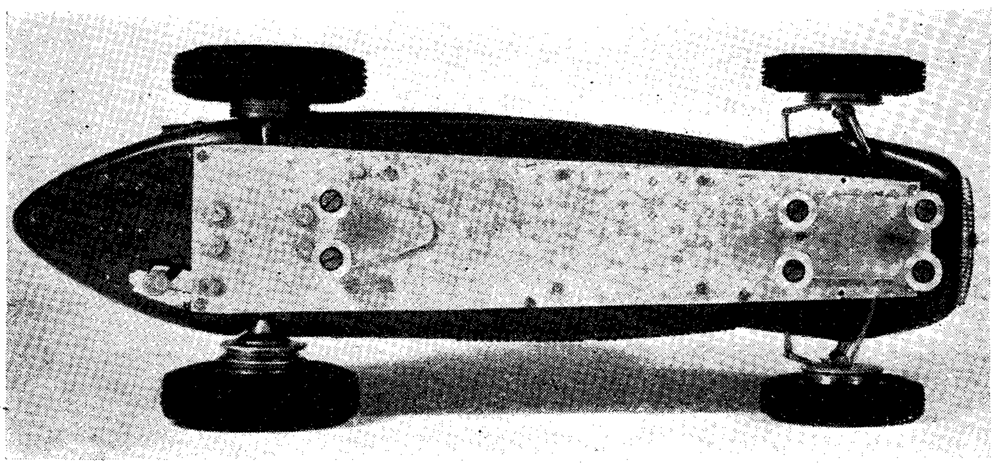
From the clutch it is natural to turn to its performance in actual operation. Here we found that the Frog 1.5 diesel engine, having been originally designed for aircraft use, drives a propeller *via* a serated member, which is attached to the drive itself by means of a taper that wasn't quite up to the job of getting a racing car weighing about 2.25 lb. off the mark, as the serated driving disc, being cast in dural, wore smooth, almost the instant things began to happen. We, therefore, found that it was necessary to drill the clutch, and tap a 4-B.A. thread within the shoes, so that a 4-B.A. stud could be located through it, and screwed into a similar tapped hole in the driving disc.

As always happens when adapting mechanisms to a use for which they were not intended, one thing leads to another, and our first indication that all was not well was when the wheel parted company with the vehicle at a rate of knots which can only be described as considerable. Our adapted drive had proved too much for the taper fit. It was easily rectified by banging the assembly on to the taper really firmly.



General view from the rear

Should anyone feel that these words are a criticism of the Frog engine, please think so no longer, as I have already said the engine is



Showing the clean efficient arrangement of the underside. Note the tail louvres, essential for the escape of exhaust gases

designed for other purposes, and the adaption and corrections I have mentioned are comparatively minor, and with them it functions extraordinarily well.

We seem to be creeping up on the engine itself *via* tyres, wheels, clutch and drive, and so here are some notes on it, and some minor modifications made to suit its particular purpose in this instance.

The Frog engine used in the model is a single-cylinder, two-cycle compression ignition, with rotary valve induction through hollow crankshaft with annular exhaust and transfer. The swept volume is 1.48 c.c. with a bore of 0.500, and a stroke of 0.460 in.

The compression ratio is variable, and at that point we come to the first very minor, but very important modification. We dispensed with the standard compression adjusting-screw, and put in its place a 2-B.A. Allen screw. This enabled us to fit the engine directly below the normal petrol filler apperture in the Alfa Romeo head fairing. The Allen screw lacking the "T" piece of the normal fitting is able to remain permanently in position, and the compression adjusted with an Allen key through the filler orifice which, incidentally, is fitted with a cover which turns into position covering the hole when the engine compression is adjusted satisfactorily, and the key removed.

Next modification was the removal of the fuel tank. In its place a "rear axle casing" was turned in dural with an extension to carry the offside rear wheel—the casing was turned with a collar and fitted to the crankcase rear cover plate by means of a winged brass ring or "banjo" coupling corresponding to the cover plate fixing and, in fact, bolted to it, locking the dummy axle casing into position.

The mounting of the engine is, of course, important relative to the ground clearance. The mounting itself may be almost anything including hardwood. In our case it so happened that brass of the exact dimensions was at hand, although in the interest of lightness aluminium is recommended. A cradle was formed, the brass copiously drilled to lighten it, and the engine was bolted down. The holes in the crankcase mounting were drilled out to take rather heavier bolts, 6-B.A. instead of 8-B.A. All the bolts were wired to check any possibility of working loose owing to vibration.

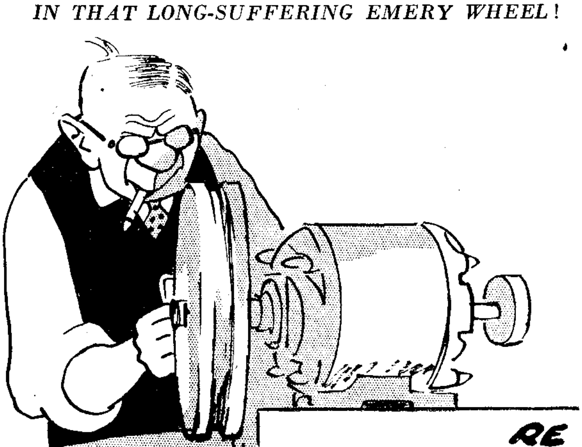
A further modification was carried out, namely that the fuel line was placed forward so that the throttle control, which was adpated with a length of flexible spring tube, could emerge from the rear of the engine, turn downwards and clip to a bracket. The screw for adjustment appeared just below the tail inside the wheel track, and while readily "get-at-able," was hardly visible to spoil any external aspect of the car.

(*To be continued*)

Whimsical Workshop Warnings

by Rick Elmes

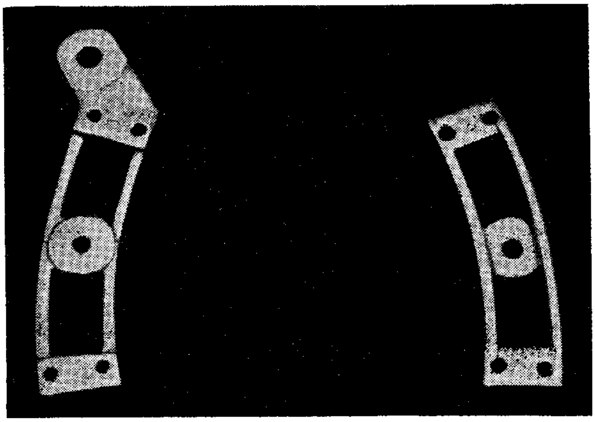
WHEN GRINDING A TOUGH BIT OF STEEL
MIX A LITTLE DISCRETION WITH ZEAL;
KEEP IT WELL ON THE MOVE
OR YOU'LL TURN A DEEP GROOVE
IN THAT LONG-SUFFERING EMERY WHEEL!



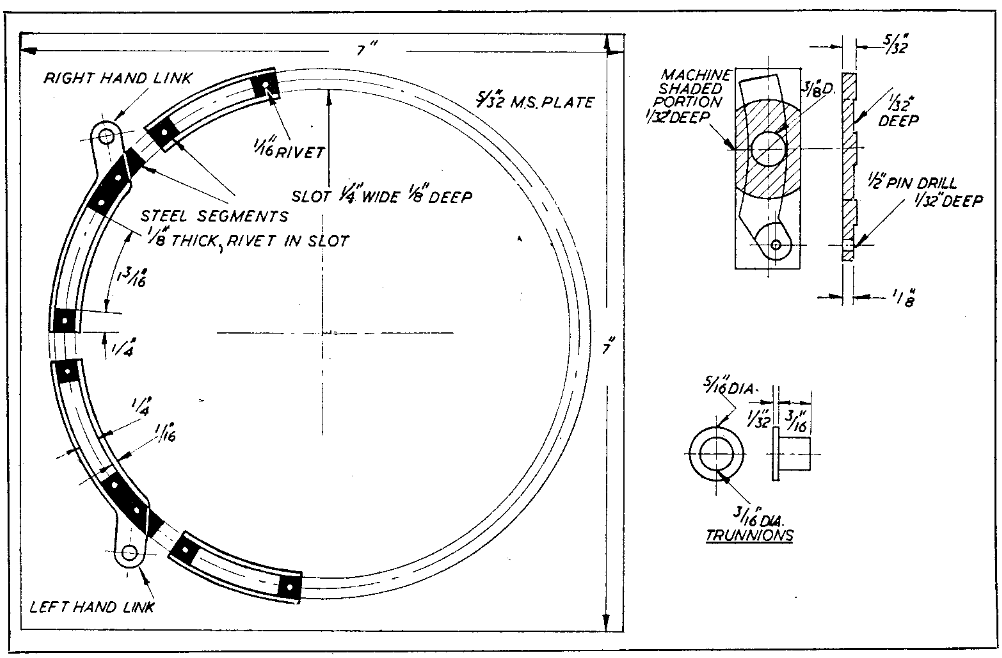
Fabricating Expansion Links

by W. A. Rogers

I HAVE adopted the following method in fabricating expansion links for a $3\frac{1}{2}$-in. gauge locomotive and have found them to be superior to hand-filed links in so far as the machined slots are of a correct radius, and, with the exception of removing the sharp edges, no further slot filing is required. A piece of 5/32-in. bright mild-steel plate about 7 in. square was clamped to the faceplate and a slot, $\frac{1}{4}$ in. wide, $\frac{1}{8}$ in. deep to a radius of $2\frac{7}{8}$ in. was machined on the plate, which was then removed and steel segments filed to press in the slot as shown in the sketch. The segments were held in place with $\frac{1}{16}$-in. iron rivets, one in the top segment and two in the bottom. The outlines of the links were then marked out on the plate and this was then cut into oblong sections, as in sketch, and each section was, in turn, fastened to the lathe faceplate, the slotted side being underneath and 1/32 in. of metal was removed in the place shown shaded, leaving a centre circle $\frac{3}{8}$ in. dia. and top and bottom portions to match the lengths of riveted inserts.



Before removing from the lathe, the thin film of metal left after turning can be broken away with a small screwdriver blade. Then remove from faceplate and drill hole in tail of links for the eccentric-rod pin, and pin drill 1/32 in. deep with $\frac{7}{16}$ in. or $\frac{1}{2}$ in. pin-drill on the opposite side to the steel inserts. The links can now be assembled in the orthodox manner, with $\frac{1}{8}$ in. steel packings riveted to tops and bottoms of links and trunnion pins silver-soldered to centre-pieces.



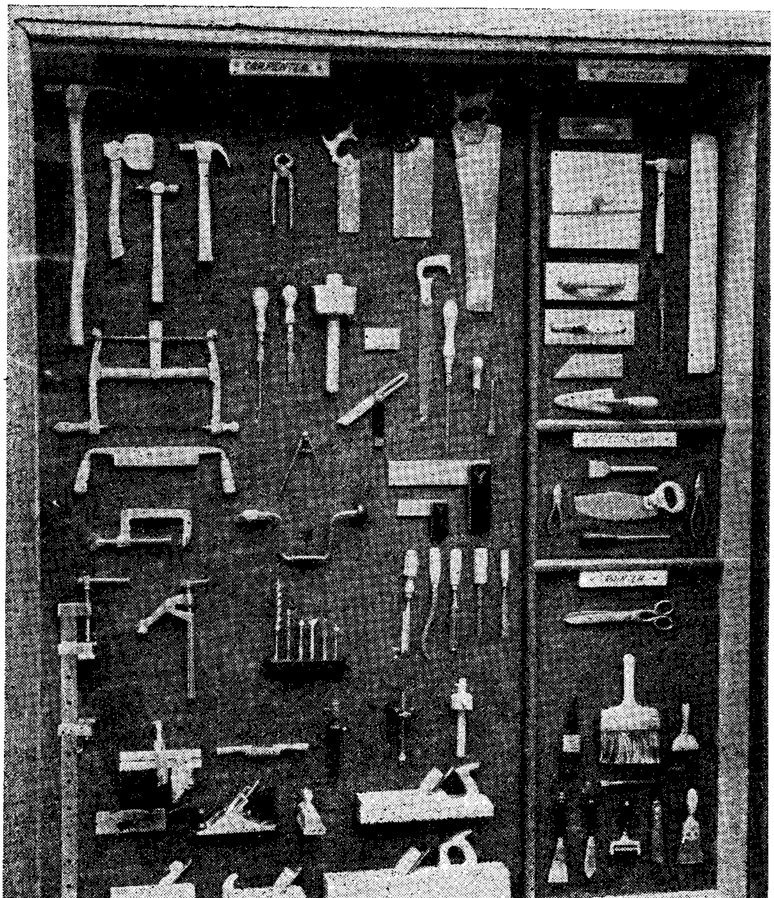
Tools of the Building Trade in Miniature

by J. W. Thomas

I NEED hardly say how delighted I was to learn that my first entry for THE MODEL ENGINEER Exhibition had gained a Silver Medal. It was a fitting climax to a long, sometimes exasperating, but most enjoyable leisure time effort.

The queer part of the whole affair is that it originated as a practical joke.

Building trade workers are notorious for their leg-pulling, and I myself, when working as a joiner, was no exception. One day on the site, when held up waiting for timber, I decided to play a joke on the old plasterer. He was very proud of his tools and his pointing trowel in particular. From a flattened out wire nail and a chip of wood I made a very presentable trowel about $\frac{1}{2}$ in. long. It had been raining that morning and when the old chap had gone for his cup of tea, I removed his trowel and replaced it with my effort. I can still see his face as I pointed out how the rain had caused it to shrink. As recompense he demanded it as a keepsake, and later turned up with it on his watch chain!



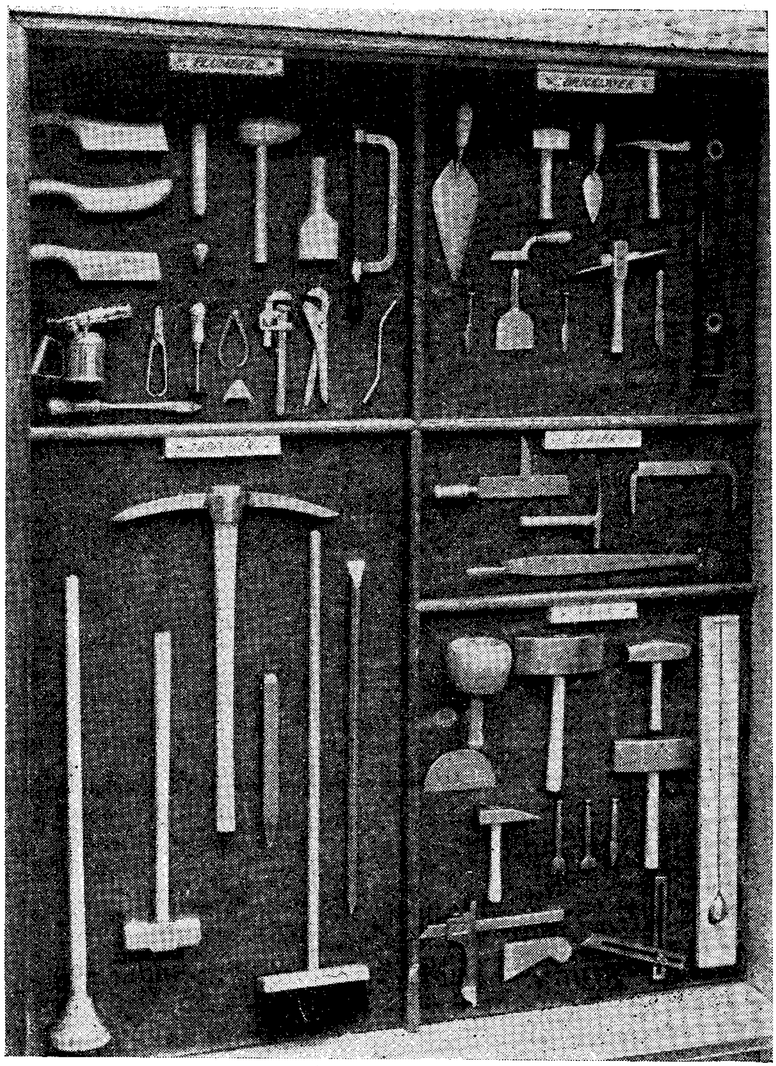
Carpenter; plasterer; electrician; painter

This was the beginning. A chisel or two were turned out (this time in my home workshop) and then a jack-plane which produced tiny shavings. This appealed to me so much that I decided to make, in miniature, a set of the tools required to build a house.

Owing to a change of employment it was necessary for me to leave home, and take up temporary residence in the London area.

Realising that I would not be able to enjoy the advantages of my home workshop, I constructed a portable self-contained work cabinet which, when closed up, did not look out of place in a living room. Incorporated in this cabinet was a $1\frac{5}{8}$-in. Flexispeed type lathe, driven by a foot motor, which was an adaptation of an old dentist's drill treadle. I had

fitted a self-centring chuck in the form of a cheap drill chuck whose straight shank was the exact size of the headstock bearings. For light woodwork a detachable bench top complete with wood vice could be clamped on. When not in use this top and the lathe could be stowed away, leaving space for a metalwork vice. I had fitted this vice with brass jaws, finding these superior to clams which have an annoying habit of slipping at a crucial moment. My polishing apparatus took the form of a small hand grinder fitted with an adaptor for polishing mops. While not as convenient as an electric buff, this method is just as effective, especially if the wife can be persuaded to turn the handle! Small drawers contained the usual collection of files, pliers, drills, screwing tackle, pin vices, etc., while a cupboard underneath contained the larger tools. Small wood chisels which are used in work of this nature, were made when needed from odd scraps of silver-steel, old files, and steel knitting needles. A useful small gouge can be made from discarded umbrella ribs. A length is cut off, driven into a suitable wooden handle and the cutting edge formed on an oilstone. No tempering is required.



Plumber; labourer; bricklayer; slater; mason

The scrap box yielded most of the metal required. Softened hacksaw blades, old clock springs, a discarded hand saw, and metal corset stays kindly supplied by long-suffering female relatives were used in the making of plane irons, saw blades, and try-square blades. I found that wire nails were extremely useful as they could be filed, forged and polished with a high degree of success. A small log of boxwood given by a friend, and a discarded ebony trinket box supplied material for the wooden parts.

I got most of the proportions and sizes by measuring the actual tools themselves. Illustrated tool catalogues also supplied a lot of information. I had decided from the outset to make them one-eighth full size, as I would get a fair amount of detail in this scale.

I am afraid some of my methods are rather unorthodox. For instance, I found it policy to drill any holes required first, and then shape the metal round the hole. The possibility of spoiling an almost completed job by faulty drilling was thus reduced to a minimum. Similarly, with letting in a piece of metal such as the brass inlay on a try-square stock. The inlaying was done first and the wood cut down to size afterwards. This seemingly difficult operation is really quite simple. The brass piece was filed to shape with slightly tapering edges and thicker than required.

(*Continued on page* 13)

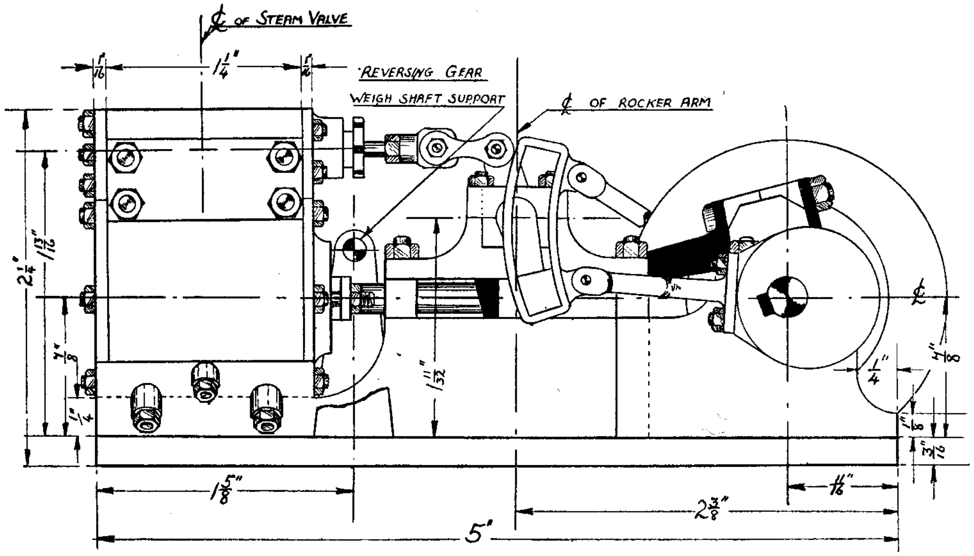
A Small Horizontal Steam Engine

by H. Grayson

IN view of the rising cost of materials, perhaps this small engine will be of interest to the newer members of the fraternity, fellows like myself who like to make things that "go," especially as it was built almost entirely from scrap.

The model was originally intended to be a replica of the engines fitted in H.M.S. *Ajax*, *circa* 1850, but due to the lack of information up accurately using the cylinder, with piston-rod and crosshead fitted as a guide.

The main bearings are split brasses secured by a steel cap, the whole being held in place by two studs, which also lock the bottom halves in position. (Drawing *G*.) The upper guide bars are mild-steel plate filed to shape and supported on distance-pieces above the lower guides, and held by studs at each corner. The rocking lever



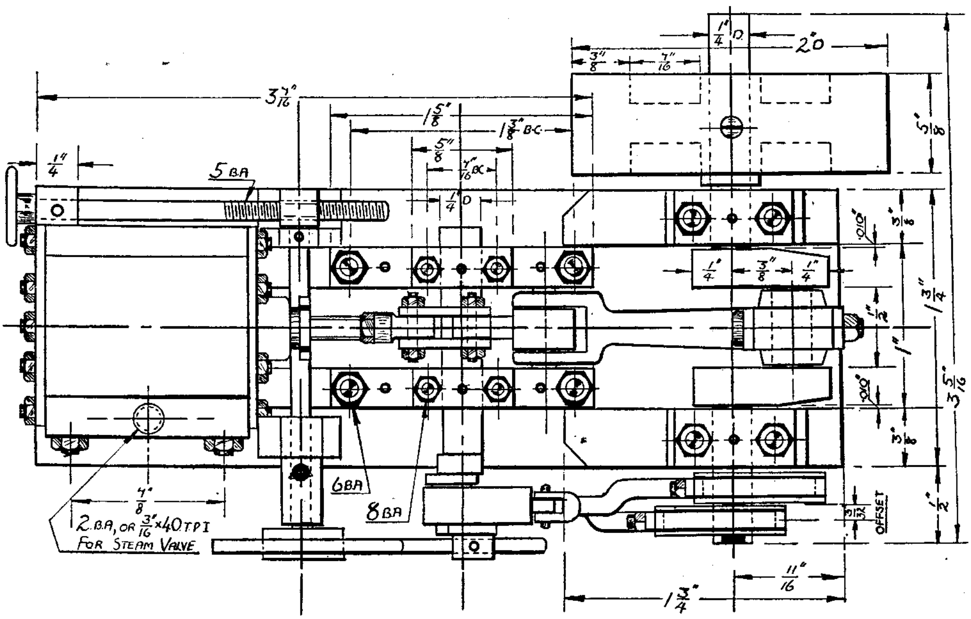
(*A*) *General arrangement, reverse gear omitted for clarity*

(the only "plan" being a photograph of a model—and experience), it was finally completed in its present form. The model is approximately 1/50th scale, having a bore and stroke of 1 in. × ¾ in., as opposed to 53 in. × 45 in. in the above-mentioned prototype. A rough sketch of what was required was first drawn, and the engine more or less designed piece by piece as construction proceeded; hence the many departures from accepted model engineering practice. The only machine used in its construction was a very old and rickety Harrison 4½-in. lathe which has now departed to a better world (or wherever old lathes go !).

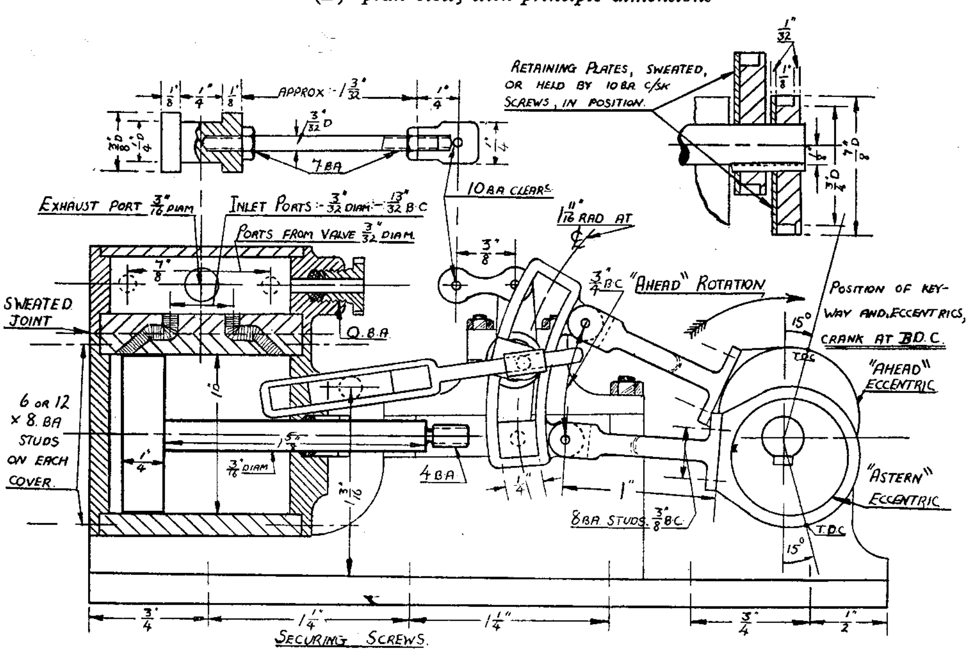
Construction was started, naturally, with the bed, which incorporates the lower guide faces, cylinder mounting, and main bearing supports. This was prefabricated from mild-steel plate, the whole being filed to shape and screwed together. The actual seating for the cylinder is better left a trifle oversize at this stage, and filed bearings are fitted to these guides, construction being similar to the main bearings. (Drawing *H*.)

Cylinder and valve-chest were next started, these being separate items riveted together. The cylinder was made from a phosphor-bronze bush, and has no embellishments, just a plain turning job, with a fine finish to the bore. End covers are fitted, each with a small tight-fitting spigot to ensure steam tightness. A simple two-stud gland is incorporated in one cover. Care must be taken with the marking-out, drilling and tapping of the securing studs, otherwise they are liable to break through the cylinder bore. 10-B.A. studs could be used here with advantage.

The valve-chest was made from a block of hard brass, filed to fit the cylinder, and bored for the piston valve, finally being reamed or lapped to a fine finish. The steam ports were next drilled and cut as shown (drawings *F* and *C*) and the two sweated together. Don't use too much solder here, or you may have a nice job



(B) *plan view, with principle dimensions*

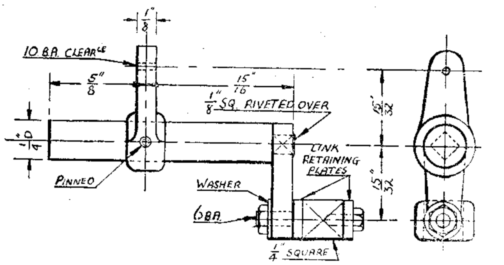


(C) *Valve gear details*

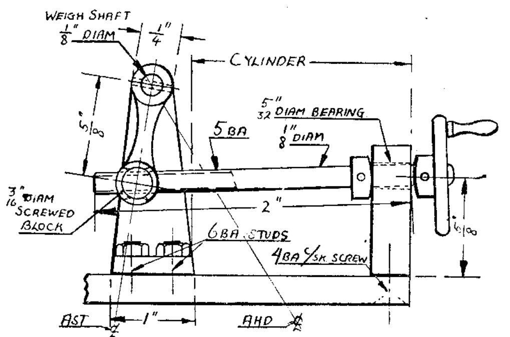
clearing it out of the steam passages. Valve-chest covers were made similar to the cylinder covers, one with a screwed gland for the valve-rod.

Piston and piston-rod were turned from a piece of bronze rod, but could be made as separate items if economy is the watchword. A piece of motor-boat propeller shaft was used in my case. No piston rings are fitted.

The crosshead is quite simple, consisting of a



(D) *Rocker lever*



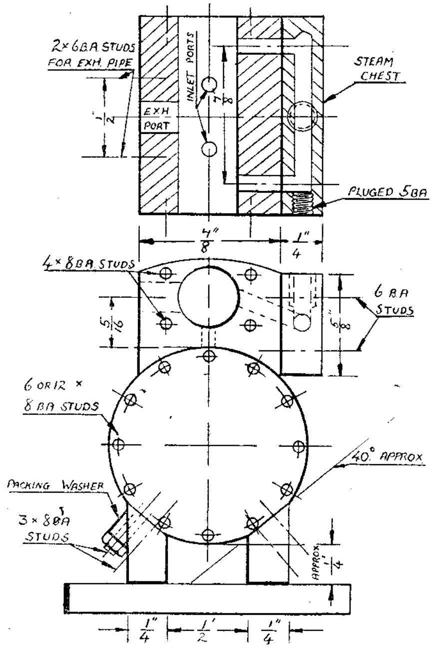
(E) *Reversing gear operating mechanism*

mild-steel block with two brass "slippers" screwed in from opposite faces. These also secure the piston-rod in position. (Drawing *J*.)

The cylinder can now be aligned and fitted to the bed, two flats being filed on the outside of the cylinder, and the side members filed to accommodate them, until the slippers just touch the lower guide faces at all positions throughout the stroke. The cylinder is then secured by six studs arranged at right-angles, or thereabouts, to the seat, taper washers are fitted so that the nuts pull up squarely. (Drawing. *F*.)

A $\frac{3}{4}$ in. H.T. bolt was utilised for the connecting-rod, being turned and filed to shape, and a split brass bottom-end bearing fitted, secured by two bolts. The crankshaft was turned from the solid, from a piece of 1 in. diameter steel bar, but a built-up one would serve just as well. No balance weights are fitted, as it was originally intended to build two such units and couple them together. The disc flywheel effectively absorbs any vibration, and is a tight fit on the shaft, secured by a screwed pin entered from the periphery.

Two eccentrics are made for the Stephenson type reverse gear, each with a "flange" on one side from hard brass or mild-steel with straps, bored to fit, made from brass plate. Care must be taken over the marking-out and fitting of the keyways, both in the eccentrics and on the crankshaft, as the engine's performance depends a lot on these. As will be seen from the drawing (*C*) the "ahead" eccentric is 75 deg. *behind* the crank, and, keeping direction of rotation the same, the "astern" eccentric is 75 deg. *ahead* of the crank. A disc is screwed or sweated on to



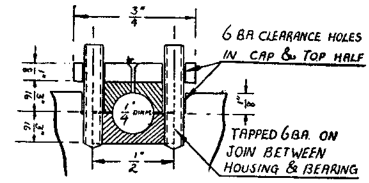
Drawing (*F*)

the eccentrics after the straps have been fitted, to hold them in place. (Drawing *C*.)

The eccentric-rods are filed to shape from brass plate and offset as shown. Construction of the linkage, rocking lever and valve may be easily followed from the drawings (*C* and *D*). Drawing *E* shows the arrangement I have for moving the links, which is quite neat and effective. The operating arm has a forked end in which the screwed block and screw are free to turn.

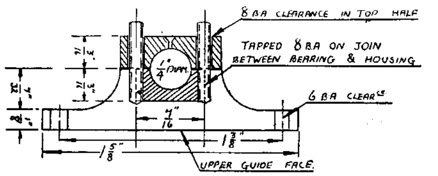
A steam-chest is bolted to the side of the valve-chest to hold the "manoeuvring valve" (drawing *F*) or alternatively the piston valve could be drilled through its length and the steam-valve fitted at one end of the valve chest.

The engine is best assembled as follows :—Bolt the cylinder complete with piston, end covers, crosshead and connecting-rod to the frame by means of the six studs and taper washers. Next, screw frame to bedplate along with main-bearing supports. Insert crankshaft and bolt up main and bottom-end bearings. The rest of the components can then be easily secured, finishing by bolting the toggle arms in place. The piston valve can be adjusted by means of the screwed rod, by observation of the valve through the exhaust port.



(*G*) *Section of main bearing*

All the steam joints were made face-to-face, as this gives a nice clean exterior to the cylinder block. No lagging is fitted on the engine but a very clean and pleasing effect is obtained by painting the cylinder and valve-chest matt,

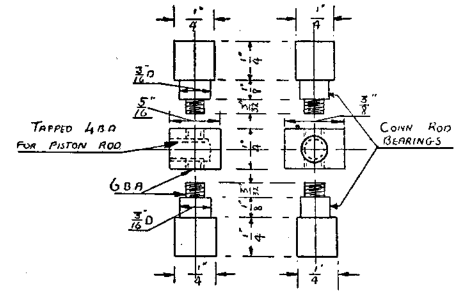


(*H*) *Rocker-arm bearing assembly*

cylinder black, and the bed and frames engine green, leaving all covers, bearing brasses, connecting-rod, etc., bare polished metal.

With regard to performance, the engine "ticks over" very smoothly at "scale" speed on about 10 lb. per sq. in. of steam, and with 50 lb. the "works" are just a blur.

My engine took about six weeks of very spare



(*J*) *Crosshead details*

time to build, so I cannot give any definite hours for construction. She ran perfectly at her first trial on compressed air, and is still running the same after over a year. She has given much pleasure to many sons, and daddies, too, who have seen her running, and to myself with the building of her. Also, an engine of this size would be an ideal gift for any mechanically-minded boy.

Tools of the Building Trade in Miniature

(*Continued from page* 9)

It was placed in position on the wood and the two squeezed together in the vice. The brass is pricked out with the point of a scriber, a touch of glue applied, and pressed in again. When dry the job is filed down flush, care being taken to avoid brass filings becoming embedded in the wood by brushing between strokes. This method will only apply to a hard dense wood such as ebony which will stand up to the pressure, leaving clean cut edges. If the inlay is on the large side several squeezes are required, the bulk of the wood being removed with a small chisel. Wood shapes, such as saw and plane handles, were cut out with a piercing saw blade which gives a much cleaner finish than a fret-saw. They were finished with small round needle files, and burnished with a small stick of boxwood. The hair with which the painters' brushes were made is human hair, the female variety being found to be the finest. My mother gallantly came forward when the tool catalogue stated "Best grey bristle." It was quite a problem to find a piece that didn't curl up, but this was finally conquered by a thin application of nail varnish.

The bristles in the labourer's broom were made with paste brushes from Woolworth's. Seventy four holes were drilled in a piece of boxwood and about a dozen bristles were glued in each hole. When everything was dry, the top was planed down flush, and a thin piece of wood glued on top, Tools such as the snips, scissors, and pincers, were made by riveting two plates together, one rivet hole being utilised as the pivot hole. The plates were marked out and filed to shape. They were then separated and reversed, thus ensuring that each side was identical with the other.

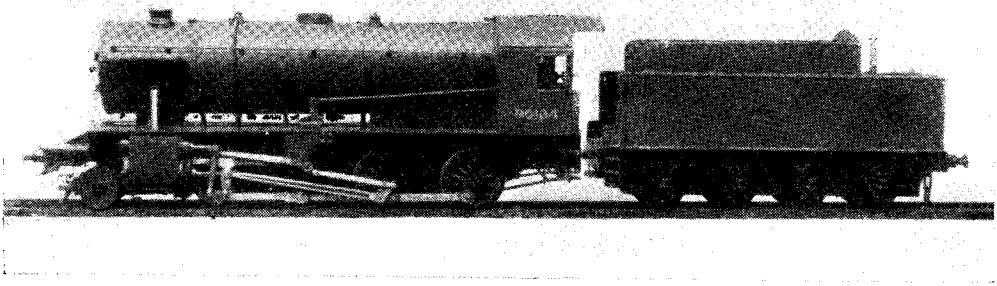
The twist bit was made by filing two opposite flat faces on a wire nail, gripping in a vice, heating to redness and twisting with a pair of pliers. It was found at first that this resulted in the twists coiling up on themselves at the vice end. This was remedied by heating each twist separately with a needle flame from a gas blowpipe. A projecting piece was left on all the tools to enable them to be gripped in a hand vice during operations. After the final polishing this was sawn off. The round tool handles which were turned in the lathe, were gripped in the chuck and shaped by means of smaller editions of wood turning chisels made specially for the purpose.

The woodwork was finished by a few light coats of button polish, and the metal highly buffed. As the tools are sealed under glass they should retain their bright appearance almost indefinitely. They are fixed in position by means of tiny pins soldered on the back.

The soft wood back board into which they are pressed is covered with blue pan velvet glued on to it by the edges only. The showcase is made in mahogany dovetailed together, and hinged in the middle so that it closes up like a book for convenience in carrying.

"L.B.S.C.'s" Lobby Chat

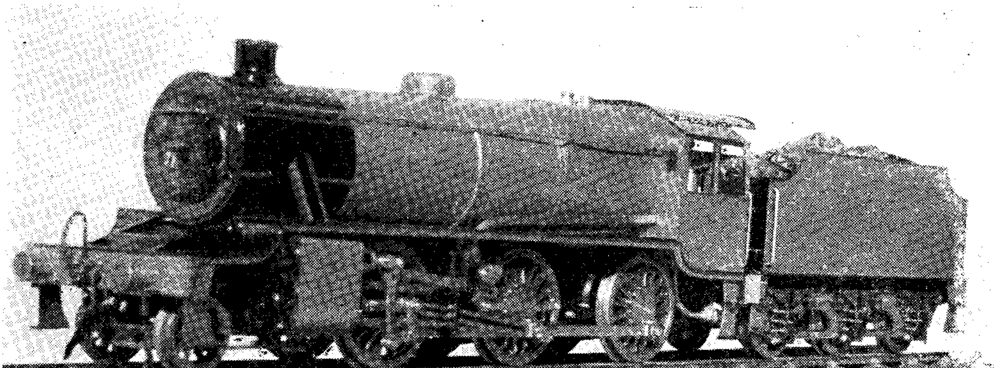
What "The Boys" are Doing



Mr. A. Walter's 2½-in. gauge "Austere Ada"

AS we start on another year—a year which, let us hope, will see the beginning of a move toward world peace and general happiness—I thought it might prove interesting and encouraging to newcomers to our craft, if I chronicled and illustrated some of the locomotive-building achievements of sundry "lads of the villages." I often receive letters from good folk who wish to build a locomotive, but are deterred because they either don't know the first regular step in the job, or follow a means of livelihood far removed from engineering, or both. Let them take heart and confidence, from the fine example of Mr. Alf Walters, whose 2½-in. gauge *Austere Ada* is illustrated here. Friend Walters is a bricklayer by trade; a very essential occupation at any time, but not exactly helpful in the work of building a little locomotive although there is actually a bricklaying job on a full-sized engine, viz. the brick arch in the firebox. On some of the older L.B. & S.C.R. engines there was a layer of firebricks over the cylinders at the bottom of the smokebox, to preserve them from corrosion. Our worthy friend got busy when materials were scarce, and had to make do with whatever was available; for example, he turned the pony wheels from a piece of an old cast-iron window sash weight. As he had no technical knowledge, he relied implicitly on the instructions given in my notes; and the chassis duly completed, gave very satisfactory results when tested by air pressure.

Mr. Walters then tackled the boiler and had no trouble in successfully completing it by aid of two blowlamps, a five-pint and a one-pint; and the first test under steam far exceeded all his expectations. He had no track of his own at the time, but is now building one. He said that right from a lad, it had been his ambition to build a real steam locomotive, and now at the



Mr. H. Travis's L.M.S. 2-6-0, built from "Dyak" instructions

age of 51, he has realised his ambition; better late than never! The engine is finished in dark green and black, and is certainly a creditable job. Like Oliver Twist our worthy friend yearned for more; and with the experience gained, has now more than half completed a $3\frac{1}{2}$-in. gauge *Pamela*, saying that there is no trouble whatever in following the instructions. Congratulations on your work, brother, and thank you for kind appreciation of my notes.

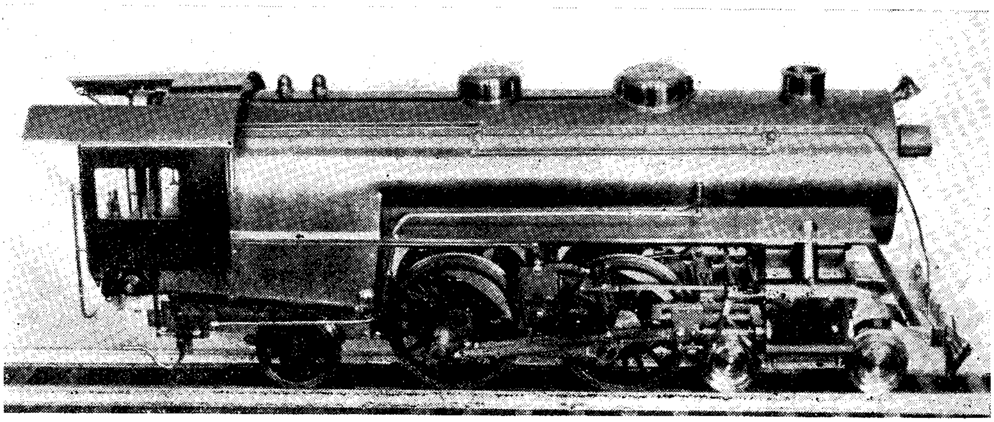
A "Dyak" in L.M.S. Guise

A reader who lives near Stockport, Mr. H. Travis, started to build a $2\frac{1}{2}$-in. gauge Dyak in 1935, according to the instructions I gave for that engine; but having a preference for the L.M.S. 2-6-0 engines, he gave his own job the L.M.S. type cab, boiler mountings, chimney and other details, with the pleasing result shown in the picture. It was a long job, as the engine was not finished till 1946; but the builder says it gave him many happy hours in his workshop. The engine is a good worker and has no trouble in hauling its twelve-stone owner. Mr. Travis also expresses appreciation of the instructions, for which your humble servant bows gratefully.

Our friend put a query in his letter, the answer to which may be of use to others, of the same turn of mind. He started to build a *Doris* 4-6-0, and had turned the coupled wheels to the specified $4\frac{1}{2}$ in. diameter when the notes on *Britannia* started, and he promptly fell in love with that lady. He wants to build *Britannia* instead of *Doris*, and asks if he can use the ready-turned wheels by altering the height of axle-centres and inclining the cylinders; but is afraid of adversely affecting the valve-gear. The best thing to do is to fit the cylinders and valve-gear exactly as I shall specify and leave the axle centres as they are. This will lower the frame by $\frac{1}{16}$ in. but will not be noticeable in the finished job. The bogie will need a thinner rubbing plate, and the height of the pony truck can be adjusted to suit the frames. The holes in the tender axleboxes can be drilled $\frac{1}{16}$ in. above the correct position. The finished job will then look no different from an engine having the $4\frac{5}{8}$ in. coupled wheels, and the working will not be affected in the slightest.

A $3\frac{1}{2}$-in. Gauge American "Atlantic"

Now let's take a look across the big pond at a fine $3\frac{1}{2}$-in. gauge job; to wit, an "Atlantic" type engine built by Mr. E. Stalder, of Elmwood Park, Illinois. Our friend is a maker of small diesel parts, and served his time in a Swiss factory making watchmakers' machines, so naturally is a skilled worker, but that is a help in building little locomotives, and Mr. Stalder has put some really excellent work into the job shown in the reproduced photograph. Although she is an American type of locomotive, our worthy friend relied on my notes for his details; for example, she has a *Doris* bogie, without the equalisers; *Pamela* eccentric-driven and hand pumps, check valves, and water gauge; *Pamela* mechanical lubricator; *Hielan' Lassie* snifting-valves, but located on the steam-chest; *Tich* reversing lever; *Doris* injector. Other fittings were taken from *The Live Steam Book*. Cylinders are $1\frac{1}{4}$ in. $\times$ $1\frac{3}{4}$ in. with $\frac{5}{8}$-in. piston-valves; coupled wheels 5 in. diameter. The wheels and the body of the front end throttle were the only castings used, all the rest being built up.

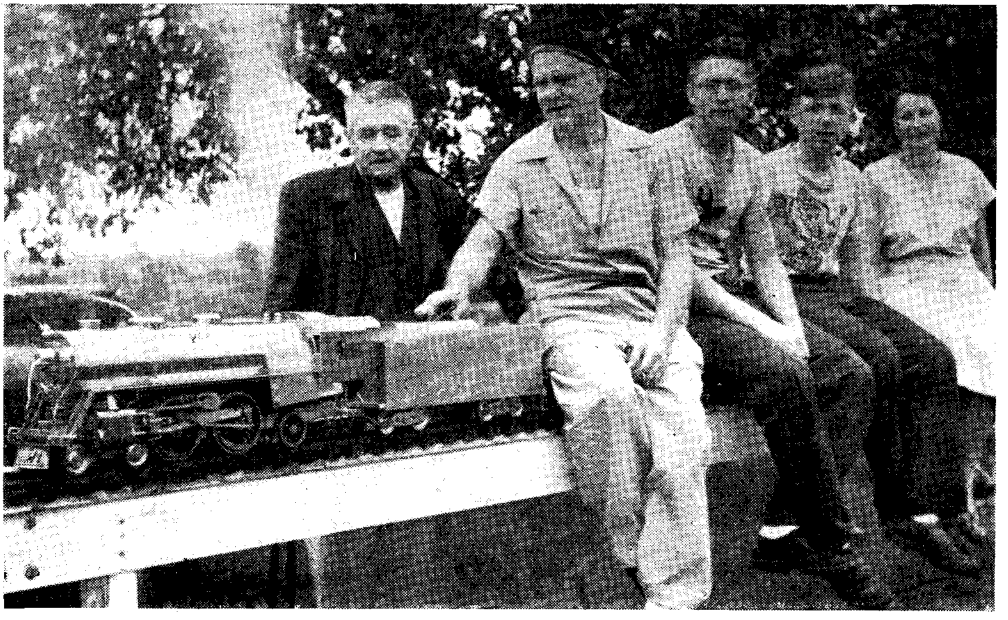


Mr. E. Stalder's $3\frac{1}{2}$-in. gauge "Atlantic" incorporates "Live Steam" components

Mr. Stalder gives an amusing account of the "encouragement" he received from the wise(?) folk who know all the answers; you meet them in every club He was advised to "use a steel boiler, copper is no good; make a bigger firebox; firehole door is too small; axle-driven pumps are no good, neither are superheaters, and injectors are not reliable—"L.B.S.C." can get them to work, but can you? Piston valves are too delicate a job, they have to be burnished and lapped to make them steam-tight"—and so on and so forth! Well, our friend took no notice, followed the words and music, and this is what he says, in his own words:—

"The first time I steamed her up, I got the thrill of my life when I saw how quick I got the safety-valves popping, and how she stayed right

up there all the time. I have 80 ft. of straight track, and she ran on this all the afternoon pulling four flat cars loaded up with neighbour's kids. At six o'clock it started to rain, so we had to quit ; my wife was glad, as the kids had trampled most of her flowers down. As there was still a good fire in the box, and the safety-valves kept on popping, my son sat under an umbrella and watched her whilst I went to see some friends in the house. An hour later she was still popping off, so I went out, opened the blowdown-valve, blew some of the water out, and filled her up with the injector."



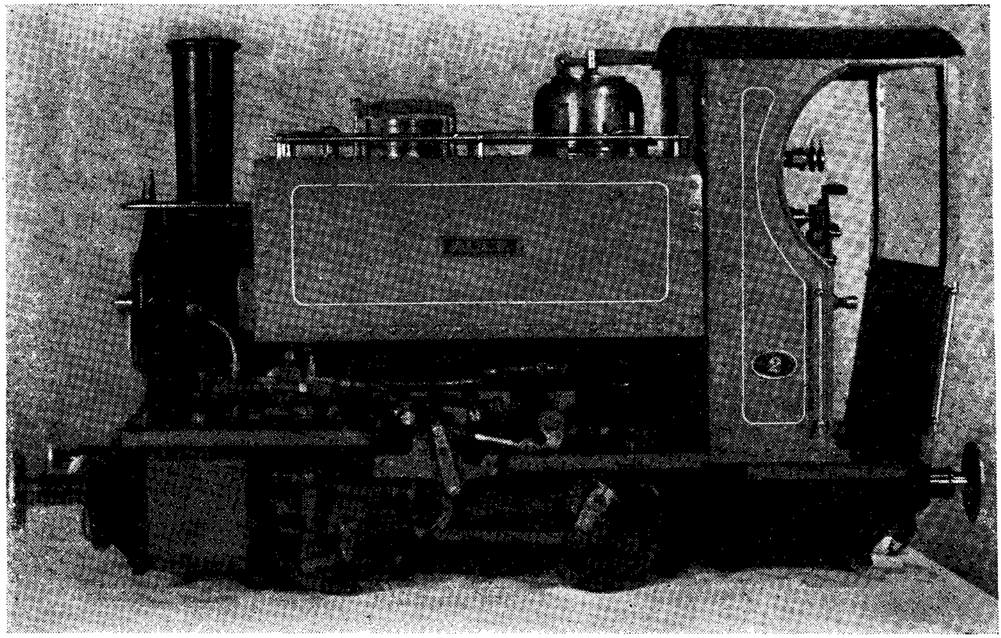
Three generations of enginemen—Mr. Stalder Senr. (retired Swiss driver), Mr. E. Stalder (driving) Mrs. Stalder, and sons

Mr. Stalder was advised to use a $\frac{5}{8}$-in. ram on his axle-driven pump, but he thought that if he used *Pamela's* $\frac{3}{8}$-in. pump, it wouldn't need a bypass, so he fitted it. Even on the 80 ft. straight line, the water kept going up the glass, and the blowdown had to be used to prevent flooding. He bushed the pump to 9/32 in. and made a ram to fit, but still the water creeps up, so he is fitting the bypass ; yet an American design for the same size of engine, specifies *two* $\frac{7}{16}$-in. pumps ! It must be related to the S.R. spam cans. To conclude, the engine is finished bright ; only the wheel spokes are painted, the rest being monel metal, nickel-silver or rustless steel. The injector, for example, has a monel body, nickel-silver cones, and rustless-steel caps. The engine is a really magnificent job, for which the builder deserves full credit.

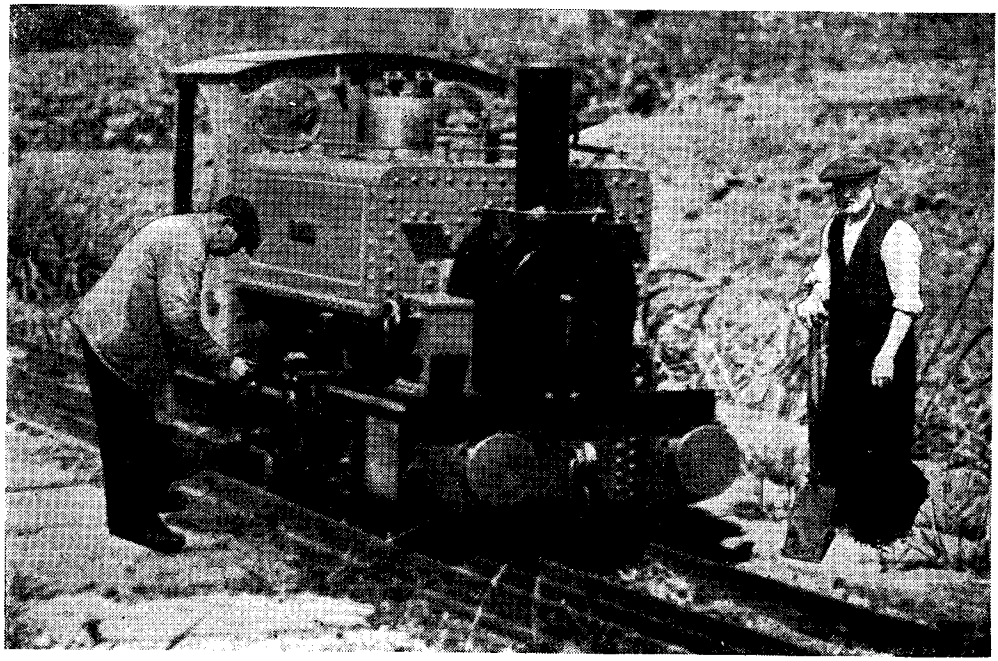
A Unique 5-in. Gauge Contractor's Engine

The narrow-gauge saddle tank shown in the accompanying photograph reproductions, was designed and built by a Liverpool reader, Mr. E. Stephens, and represents his idea of a "maid-of-all-work," of the type in use by contractors about fifty years ago. Our friend incorporated in the job, components taken from several locomotives described in these notes ; for example, she has cylinders and Baker valve-gear as specified for *Hielan' Lassie* ; boiler and mechanical pump, *P. V. Baker* ; *Petrolea* regulator, and *Tich* spring-balance safety-valves. The only drawing used in the construction, was a rough general arrangement sketch. Sizes of boiler, cylinders, etc. are same as the engines mentioned above ; the coupled wheels are 3 in. diameter. Frames are of $\frac{1}{8}$-in. plate, $2\frac{1}{2}$ in. deep ; buffer beams 2 in. $\times$ $\frac{1}{4}$ in., length 22 in., width 9 in., height to top of chimney $13\frac{1}{2}$ in., and weight 130 lb. The only castings used, were cylinders and wheels. The saddle-tank is made from 16-gauge copper, and holds six pints. As will be seen from the above brief specification, the engine is really a small $3\frac{1}{2}$-in. gauge job, spread out to run on a 5-in. line ; *Tich* made one size larger !

The tank holds enough water for a nonstop run of 20 min., hauling the driver only, covering a distance of over two miles, on half-regulator and approximately 40 per cent. cut-off ; if not checked, she rapidly accelerates to a dangerous speed. She runs on a ground-level undulating line, one part of which has a bank, with a gradient of 1 in 108 ; three passengers on a single car are taken up this with ease. Building the line was no playtime effort, as it involved making a cutting 130 ft. long, maximum depth 4 ft. 6 in. through solid sandstone. The line, known as the Willow Bank Railway, does not belong to Mr. Stephens, but to his friend Mr. Joe Evans, who built it in



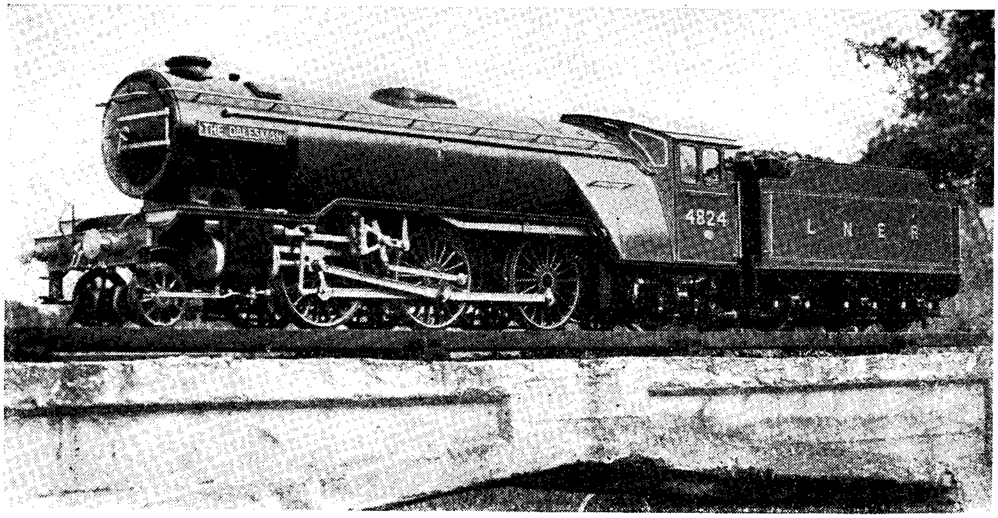
A 5-in. gauge contractor's engine built by Mr. E. Stephens



"—and it is said that photographs can't emulate Ananias!"

three months, aided by his brother. Friend Evans is shown in the " fake " photograph oiling up the locomotive. Some folk say photographs don't lie ; but this one would be a pretty good Ananias if it weren't for the apparently outsize rails ! Friend Stephens deserves commendation for his unique job, and once more I render thanks for kind appreciation of the help given by these notes.

This gives a very easy-running bearing, like the mandrel of a precision lathe ; in fact, many folk thought that the tender ran on ball-bearings. The boiler is of copper throughout, and weighs 1 cwt. It has three superheater flues, and a Stroudley regulator, and is fed by two mechanical pumps on one frame stay, and an injector under the trailing end. The ashpan has an arrangement by which it can be cleared of accumulated ashes



Mr. W. Lynch's 5-in. gauge " Green Arrow " type locomotive " The Dalesman "

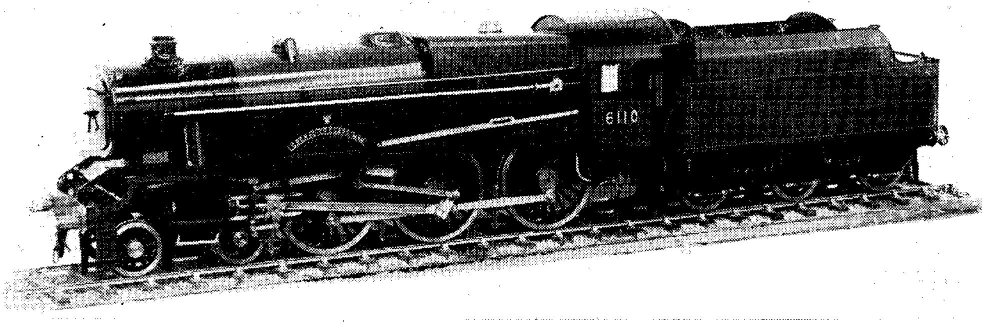
whilst running, and this ensures a free flow of air to the grate at all times. Cab and tender body are of 14-gauge brass, and the cab front is $\frac{1}{8}$ in. thick ; friend Lynch says it was a dickens of a job getting the V-front properly fitted ! Instead of a pony king-pin, a ball-joint was used, midway between the leading coupled wheels ; at first there was a tendency to derail at speed, but deeper flanges cured that antic. Working brakes are fitted throughout ; and on an engine of this size and weight, are effective. Our worthy friend concluded his letter with the too-true remark that the only drawback about the locomotive, was its weight, which is fully realised when she is taken out for a run on the club track or elsewhere. Hearty comgratulations to Mr. Lynch on a magnificent job that goes as well as it looks.

Fine Modern Jobs

Now we come to a couple of very fine examples of main-line passenger engines in 5-in. gauge. The first is a *Green Arrow* 2-6-2, built by Mr. W. Lynch, of the West Riding Small Locomotive Society. I like the sound of that title, also the Blackburn Live Steamers ; the " man in the street " cannot associate them with the " model engines " sold in toy bazaars around Christmas time, for children of all ages to play with ! This engine was also a long job, being started in 1942, and finished in 1950 ; the war, of course, accounting for much of the delay. From the April of that year until the end of it, the engine was at work, and proved herself capable of shifting two tons on the level. She would take $1\frac{1}{2}$ tons up the 1 in 200 bank, with 50 per cent. cut-off ; on the level it varied between 15 and 20 per cent. After a period of trial running, a few adjustments were made, and the engine painted and lined in the old L.N.E.R. colours.

The cylinders are cast-iron, $1\frac{3}{4}$ in. $\times$ $2\frac{1}{4}$ in. with four $\frac{1}{16}$-in. rings on each piston, two to a groove. Crossheads are not Laird type, but box pattern working on single guide-bars. Special attention was paid to the valve-gear, all the parts being hardened, the holes honed to size, and the pins lapped to an exact fit. The crankpins are made from oil-hardening steel. The trailing and tender boxes are cut from mild-steel bar and casehardened, the axle holes being lapped out, and the journals hardened and tempered.

Now over to the L.M.S., and take a look at Mr. George Archer's 5-in. gauge *Royal Scot* type 4-6-0. She took four years to build, but the result is well worth the time spent. Although she has the tapered boiler of the rebuilds, friend Archer fitted a single chimney ; and in doing so, anticipated full-size practice, as on the test stand at Rugby, it was found that the single chimney was just as efficient as the double one. In passing, it is curious to note that as far back as 1895, Mr. W. Dean, who at that time was locomotive superintendent of the G.W.R., carried out some chimney diameter tests, and found that the engines steamed best with a chimney bore of 12 to 13 in. according to the size of boiler. It

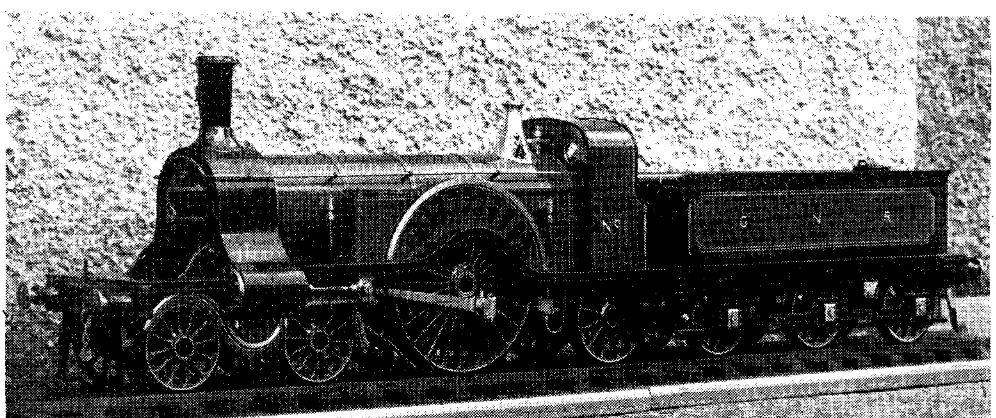


Mr. G. Archer's 5-in. gauge L.M.S. " Grenadier Guardsman "

was at that time, too, that the extended smokebox first made its appearance on the G.W.R. Uninitiated readers may be interested to learn that the apparently wide chimneys on modern G.W.R. engines are—well, misleading, shall we say, because inside of each one is a tapered liner, with a comparatively small throat. I fitted a wide chimney and a " cow's-teat " blastpipe top to my 4-6-2 *Tugboat Annie*, as a matter of experiment. She steams all right and uses little coal, but I'm of the opinion that an ordinary single blast nozzle, and a chimney like *Britannia*, would be just as effective. The blast is very light.

As I have referred to various parts of friend Archer's engine in previous notes, there is no need to recapitulate (says the third programme) but those lines of neat rivet-heads in the tender will bring joy to the hearts of many readers of these notes, including my dear old friend " Bill Massive." Now let me whisper in your ear—Curly had a very weeny share in building this locomotive—I made the injector, which you can see under the cab. Our worthy friend calls it by the Indian name of Dhamdurti—because it Singhs ! ! The engine goes as well as she looks, and is a very excellent job in every way.

The last photograph, of a very fine piece of work by Mr. Tom Horne (already described in these notes) will bring back memories of the days now long departed, when a dirty locomotive was just as rare a sight as a clean one is nowadays. *Haven't* we " progressed " ! " Economists "—how I HATE that term !—try to convince us that a filthy engine can pull a train as well as a clean one, so why waste money in cleaning it ? Personally, I'd like to tell them that a couple of old sacks would keep their bodies as warm as a fifty-guinea Sackville-Row suit, and probably be a lot more comfortable ; but I'm mighty sure they wouldn't wear the sacks for that reason ! They would probably begin to moan about the appearance, and the psychological effect upon observers ; well, bless their ivory heads and apathetic souls, doesn't the same apply to locomotives ? One evening last summer, I was returning home on my gasoline buggy, after visiting an old friend at Corringham, and was stopped at the level crossing at Stanford-le-hope, to let a L.M.S. train pass. The sight of the lump of dirt, with a 2-6-4 tank hidden inside it, that hauled seven dilapidated coaches over the crossing, gave me a bad heart for the rest of the drive home—nuff sed !



Those were *the days* ! *Mr. Tom Horne thought so, too, when he built a small G.N.R. eight-footer*

GET WEAVING!

W. G. Field concludes his article with hints on setting up the loom

BEFORE explaining how to use the loom, constructional details of which were given in a previous issue, the reader is advised to acquaint himself with the following short glossary of terms used in weaving. A few minutes spent in absorbing this list will make subsequent terminology more understandable.

End. One warp thread.

Hank. A bundle of 100-150 threads, each two yards in length.

Heald. Wires which are threaded on to the heddles. Each heald has a loop (eyelet) at its centre point through which passes one warp.

Heddle. The frame which carries the healds. A heddle is raised so that in turn the healds attached to it lift a given number of warps above the level of other warps not associated with that particular heddle.

Loom. The name given to the complete apparatus upon which weaving is effected.

Pick. One weft thread.

Reed. A comb-like frame which is pulled toward the operator after each pick is inserted. Its effect is to force the wefts close to each other in order to consolidate the weave. The spaces between the teeth are called " dents " and the reed size is quoted as being so many dents to the inch.

Sett. A certain number of threads per inch. The sett is qualified by the appropriate number.

Shed and Counter

Shed. The space created between the warps when the heddles are raised. Shedding, or parting of the warps by means of heddles, allows for the free passage of the shuttle to form the weft.

Shuttle. A stick with a groove at each end, and on which thread is wound. The shuttle carries the thread through the shed and counter-shed to form the weft.

Warp. Threads that run lengthwise in a weave.

Weaving. The art of interlacing two sets of threads at right-angles to each other.

Weft. Threads that run crosswise in a weave.

The following instructions should be carried out to weave a full-width fabric 10 yards long.

**Concluded from page* 826, *Vol.* 105, " *M.E.*," *December 20th*, 1951.

Allowing an extra yard for loss in securing the thread to the rollers, and reduction caused by the wefts, cut your thread into lengths of 11 yards. Probably the simplest way will be to place two chairs back to back and sufficiently wide apart so that one complete wind equals 11 yards. The number of 11-yard lengths which you will have to cut is decided by the number of reed dents, namely, 280.

(One further consideration is necessary in setting up the loom. All woven fabric has what is called a *selvedge* to prevent unravelling and to give strength. The selvedge is formed by passing *two* warp threads through the extreme right-hand and left-hand reed dents, and continuing the same two warps through one eyelet in the extreme right-hand heald in heddle No. 1, and the extreme left-hand heald in heddle No. 2. For a practice weave, this is not essential, but it is a good plan to adopt the arrangement from the very beginning.)

Secure one end of each thread to the first roller by passing it through the slot and knotting, and then pass the threads over the front roller bar and through the reed, one thread to each dent. Then, in your mind's eye, number the threads from right to left as you face the loom. Raise the first heddle, and pass the *odd-numbered* threads through the eyelets of the 140 healds provided.

Next, take the *even-numbered* threads and repeat the process with the second heddle.

Pass *all* the 280 threads over the rear-roller bar, and secure the free ends of the threads to the rear roller in exactly the same way as you have done for the front roller.

All that remains now is carefully to wind the slack on to the rear roller, inserting strips of paper between each complete turn to protect the thread. Continue winding until all the slack is taken up on the rear roller, and the natural tension of the thread is attained. Do not tighten beyond the natural tension, as this will stretch the fabric. The requisite tautness is maintained by the ratchets attached to each roller.

The next thing is to wind a convenient length of thread about the shuttle. Too much will cause difficulty in passing it through the shed, and too little will means several joins throughout the weft.

Raise the front heddle by means of the lever provided, thereby creating a shed. Pass the shuttle through the shed from right to left, leaving about 3 in. of the end of your shuttle thread hanging outside the first warp. (When your weave is complete, this end is darned in and secured to the body of the weave.)

You should now have the shuttle in your left hand, and the first heddle will have returned to its normal position. At the same time, the odd-numbered warps will have slotted back into their horizontal position, thereby interlacing

the first weft alternatively under the first warp, over the second, under the third, etc.

Now, with your right hand, pull the reed forward as far as it will go, and return it to normal again. Then, with your right hand again, raise the second heddle by means of its lever, and pass the shuttle from left to right through the counter-shed. Once again, pull the reed towards you, so that it pushes the second weft tight against the first. This action will cause a very slight loop to occur at the ends of the wefts, and which must be countered by a slight tension applied to the thread from the shuttle end.

This process is repeated continuously, namely : Raise the first heddle with the left hand ; pass the shuttle through the shed with the right hand, receiving it with the left ; pull the reed forward with the right hand and return it ; raise the second heddle with the right hand ; pass the shuttle back through the counter-shed with the left hand, receiving it with the right ; pull the reed forward with the left hand.

Continue weaving in this fashion until the depth of the shed, as the weft gets closer to the reed, decreases to the extent of prohibiting the comfortable passage of the shuttle.

At this stage it will be necessary to unwind the rear roller to allow for the completed weave to be taken up on the front roller.

Weaving is then continued throughout the ten yards effective weaving length. From time to time, it will be necessary to replenish the thread on the shuttle, always leaving an overlap of thread on the initial weft of the new wind for subsequent darning in. The very last weft of all must also be allowed to overlap for the same purpose.

Having followed the above instructions, the resultant weave will be what is known as *tabby* which is simply an over and under weave. When the last weft has been completed, there will obviously be unwoven lengths of warps between the reed and the rear roller. These ends should be cut about 3 in. beyond the final weft and darned in. Then release the ratchet on the first roller, and unwind the woven fabric. The unwoven front warp ends should be treated in the same fashion.

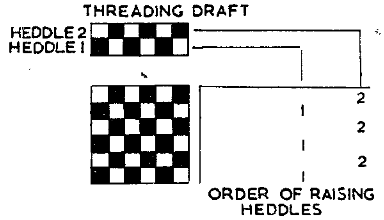
It is probable that for your first weave, a practice run will be desirable. In that case, the number of warps, and their length should be reduced to suit the circumstances. You may, for example, decide to weave only a yard of fabric some 6 in. wide. In this case, only 84 warps (14 to the inch width) of an initial length of two yards should be inserted.

General Warping Instructions

To obtain 14 threads per inch with a 14 dent reed, take one thread through every dent. For 21 threads per inch, take two threads through the first dent in the reed, one through the second, two through the third, one through the fourth, etc. For 28 threads per inch, take two threads to every dent. For finer materials, put three or more threads to every dent. With three-ply wool, 3/2 or 6/3 cotton, use 14 threads per inch. With two-ply wool, use 14 or 21 threads per inch. With one-ply wool and 12/2 cotton, use 28 threads per inch.

Patterns

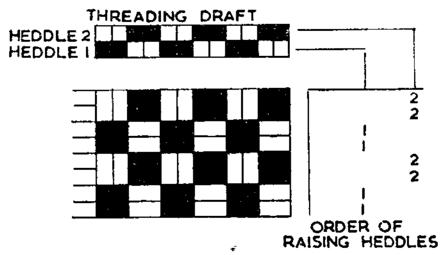
Patterns in the weave obviously depend upon the number of sections into which the warps can be divided and shedded independently of each other. This in turn is regulated by the number of heddles. As the loom already described consists of two heddles only, the more intricate patterns are beyond its scope. However, it allows for quite a variety of design, and the different patterns which can be constructed with it are as follows :—



Tabby

Threading Drafts for Two-heddle Looms

First the plain weave or tabby. The black squares in the threading draft represent where a single thread passes through a heald on the appropriate shaft. Thus, reading from the right, the first thread passes through a heald on shaft 2, the second thread through a heald on shaft 1. Below the threading draft is a diagram showing how the finished cloth will look. To the right of the diagram is the order of lifting the heddles to obtain the given cloth.



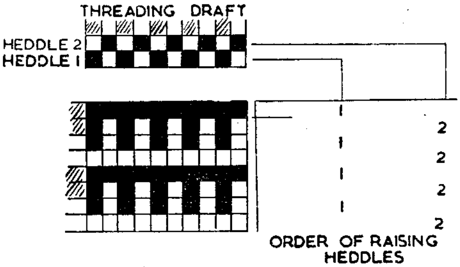
Hopsack

Hopsack

In the making of this cloth, which is suitable for most purposes, wool is used for tweeds and scarves, cotton, or cotton warp and wool weft for furnishings. The shuttle is passed through each shed (i.e. the gap between the threads made by the heddle lifting) twice. To prevent the weft thread pulling back the second time through, pass it round the last thread of the warp before going back. It is more wise not to use too thick a thread for this weave, or it will make a rather loose cloth. Two-ply knitting wool is suitable for scarves, etc., 6/2 cotton at 14 threads per inch or 12/2 cotton at 28 threads per inch for furnishings. 6/2 cotton with a tweed wool weft is extremely hardwearing for chair seats, etc.

Sawtooth and Comb Weaves

As a two-heddle loom is dependent on colour for its pattern variation, there being only two possible heddle lifts, I now give some weaves with colour in the warp. In the diagram, the shaded squares indicate where a darker thread has been

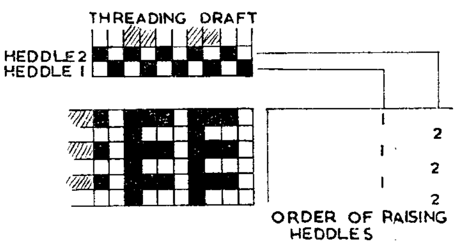


Sawtooth and comb

entered in the warp and weft respectively. These weaves are best worked in contrasting colours at 14 threads to the inch. In knitting wool or worsted, they make good scarves with a horizontal or vertical stripe effect. For cotton fabrics, use a 3/2 or 6/3 cotton and you will get a good furnishing weight cloth.

Small Shepherds' Plaid (Tabby)

This weave is very effective for all purposes. The colours as indicated by the shaded squares in the draft, are entered two light and two dark alternately in both warp and weft. In contrasting colours with 14 threads per in. the pattern will show up boldly. In a finer material with



Comb weave

two shades of the same colour, a soft all-over tweed effect is obtained. Always start with a single thread of one colour, then weave two light and two dark, or instead of a check you will get a broken stripe. With 21 threads per in. in worsted or 28 threads per in. in 3-ply botany wool, cloth suitable for jackets or waistcoats may be woven.

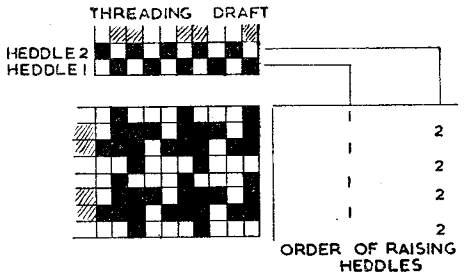
Basket Weave

This weave is often used in linen thread to make table napkins, etc. With natural or white and a pale blue or green thread it makes a very pretty cloth. If using linen, choose Nos. 10, 12 or 16 and use 28 threads per in. The shaded squares in the draft, as before, indicate darker threads entered. In heavier thread with 14 per inch it makes cushion covers, etc. It is essentially a cotton or linen weave and loses some of its effect when used in wool. The squares may be enlarged for weaving table-cloths. In the diagram the repeat is in 16 threads, which in linen at 28 threads per in. would give squares only just over $\frac{1}{4}$ in. across. For squares of 1 in. the pattern must repeat on 56 threads, 28 light first then dark, and 28 dark first then light.

Vertical or Warp Stripes

To make warp stripes, the easiest way is to use strong colours in the warp and white or grey in the weft. This will give a hazy colour effect suitable in scarves and tweeds. For cotton it is best to use a very thick warp, perhaps three or four threads to each heald and dent. For the weft, use a very fine cotton and pull reed fairly hard.

When you have had sufficient practice in

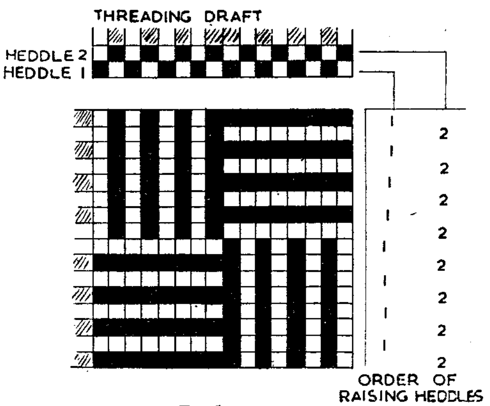


Small shepherds' plaid (Tabby)

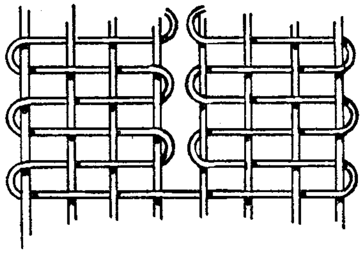
weaving the above patterns you may care to work out your own designs. This can be done on squared paper, and to illustrate the process, the sketch shows how "Tabby" would be laid out.

As an alternative to drawing your pattern, the designed effect may be created as follows: Take an ordinary cigar box and cut notches at the top and bottom. Pass your warps round the cigar box through the notches. Then, with a bodkin, insert your weft.

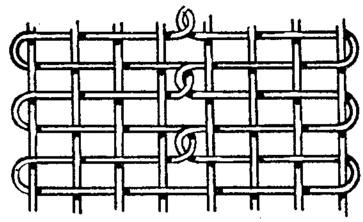
If more than one colour is to be used, both in warps and wefts, then the squares should be coloured accordingly so that the desired effect



Basket weave



Slit



Picking-up loops

Avoiding slits by picking up loops

can be seen on paper before actual weaving starts. Having decided on the pattern, then all that remains is to set up the warps as shown on your design, and to follow the chart accordingly. If more than one colour is to be used in the wefts, it will be found convenient to have as many shuttles in use as there are colours.

The use of colours often means that the shuttle does not traverse the complete width of the warps. It may pass through half the width and then return. The result of this would be a slit in weaving, and it is countered by looping in the wefts as shown in the diagrams.

Among some of the types of materials which can be used in weaving are mercerised cotton, Harris tweed wool, worsted yarn, cotton yarn, linen yarn and cotton gimp, etc. All these items can be obtained from the Weavermaster Weaving Centre at 206, Kensington Church Street, London, W.8.

The table above shows the suitability of finished fabrics of two-heddle patterns when woven with these different types of material.

Pattern	*Material used*	*Weave suitable for*
Hopsack	2-ply knitting wool	Tweeds and scarves
	6/2 cotton at 14 threads per inch Cotton warps and wool weft	Furnishings
	6/2 cotton with a tweed wool weft	Chair seats
Sawtooth	Knitting wool or worsted	Scarves
	3/2 or 6/3 cotton	Furnishings
Small shepherds' plaid ..	Worsted 21 threads per inch 3-ply botany wool 28 threads per inch	Jackets, waistcoats, etc.
Basket weave	Linen No. 10, 12 or 16 using 28 threads per inch	Table cloths and cushion covers
Vertical or warp stripes ..	2, 3- or 4-ply wool	Scarves and tweeds

Fine Weaving

The 14-dent reed used in our loom may be adapted quite easily for weaving fabrics of fine texture. Using knitting wools or thick yarns on the basis of one thread per reed dent produces material suitable for scarves, runners, etc. For weaving fabric suitable for suit and dress lengths, it is necessary to use a finer yarn, passing *two* threads through each reed dent. It should be remembered, however, that each thread must have its own heald, and that a two-thread-per-dent weave of full loom width needs twice the number of healds, namely 560.

The result of this arrangement is a fine weave of 28 threads per in., and is identical with the alternative, but less convenient, method of using a 28-dent reed.

Various threading combinations of the 14-dent reed produce results as shown in the table below :—

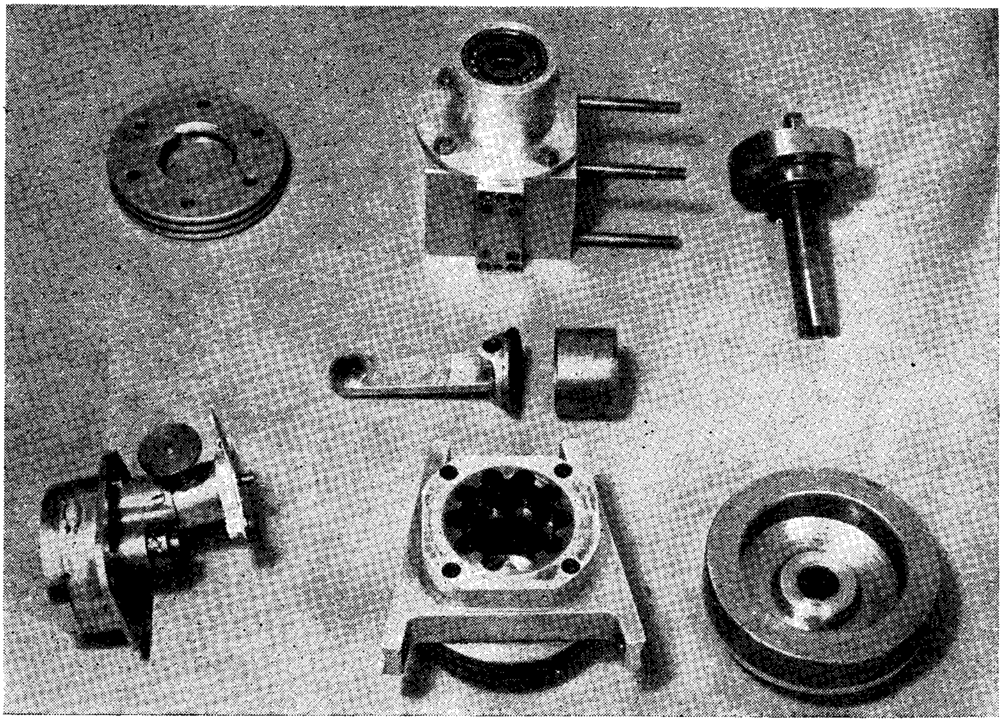
Setting	*Gives*	*Recommended for*
1 in alternate dents	7 warp ends per inch ..	Warps of finer knotted pile rugs.
1 per dent	14 warp ends per inch ..	Coarse texture cotton cloth and heavy knitting wools for scarves, etc.
1, 2, 1, 2, 1, 2, 1, 2, etc. ..	21 warp ends per inch ..	Harris tweeds and worsteds.
2 per dent	28 warp ends per inch ..	Finer worsteds, linens and cottons.
2, 3, 2, 3, 2, 3, 2, 3, etc. ..	35 warp ends per inch ..	Fine cottons and linens, shirts, dresses, etc.
3 per dent	42 warp ends per inch ..	Finer textures still for cottons, linens, etc.
3, 4, 3, 4, 3, 4, 3, 4, etc. ..	49 warp ends per inch ..	Very fine texture blouses, shirts, etc.
4 per dent	56 warp ends per inch ..	Very fine silks, rayons, linens, etc.

Model Power Boat News

by "Meridian"

*The class "B" Record-holder—*Sparky II*

BEFORE commencing to describe the engine there is one important point concerning the hull that should be mentioned, and that is the balance point. With engine and fuel tank installed, the balance point comes $3\frac{1}{2}$ in. behind the tips of the sponsons.



The components of "Sparky's" engine

Here is the general specification of the engine: bore, $1\frac{1}{8}$ in.; stroke, $\frac{7}{8}$ in.; capacity, 14.22 c.c.; 360 deg. exhaust and transfer porting; disc rotary valve inlet; flat top fitting piston (no rings); crankshaft runs on two $\frac{1}{2}$ in. bore ball-races; floating bush big-end on connecting-rod; glow-plug ignition.

The engine, as can be seen from the cross-sectional drawing, is of robust proportions and has several ingenious and perhaps daring features. The crankshaft, for example, is made from three separate pieces, press-fitted together, and the flywheel, too, is simply an interference fit on the end of the main shaft. No tapers, pins, keys, grub-screws or other fixings! As it was always intended to use glow-plug ignition, no provision has been made for conventional spark ignition in the way of contact-breakers, but, no doubt, a contact-breaker could be formed on the main shaft in a similar manner to most of the 10 c.c. commercial racing engines. The contra piston is an unusual feature but it has the advantage of eliminating all possibility of head leaks and is useful to try different compression ratios. The normal compression ratio is around 9 : 1 and although higher ratios have been tried, no noticeable improvement in engine performance has resulted. Normally, the contra piston is left set but if necessary can be adjusted by the dural head finning. This is

*Continued from page 817, Vol. 105, "M.E.," December 20, 1951.

threaded and is a good fit on the meehanite cylinder barrel.

For an engine of only $\frac{7}{8}$ in. stroke, the crankcase appears rather large and this is explained by the fact that originally a ball-bearing big-end was tried ; however, this was not entirely satisfactory and a floating bush type of big-end bearing was substituted. This has proved very successful and has not been renewed since its adoption. No pressure lubrication is used, oil being supplied with the fuel—the usual practice for two-stroke engines.

The piston has an unconventional method of securing the little-end yoke, which is riveted to the piston crown with four iron rivets. Again, this method has proved its worth against the screwed type of composite piston which always seems to come undone at the wrong moment !

This type of engine, although simple in many ways, presents one or two tricky machining problems, and it is not a design recommended for beginners in model i.c. engine construction. Nevertheless, more experienced readers could tackle the job with every hope of success.

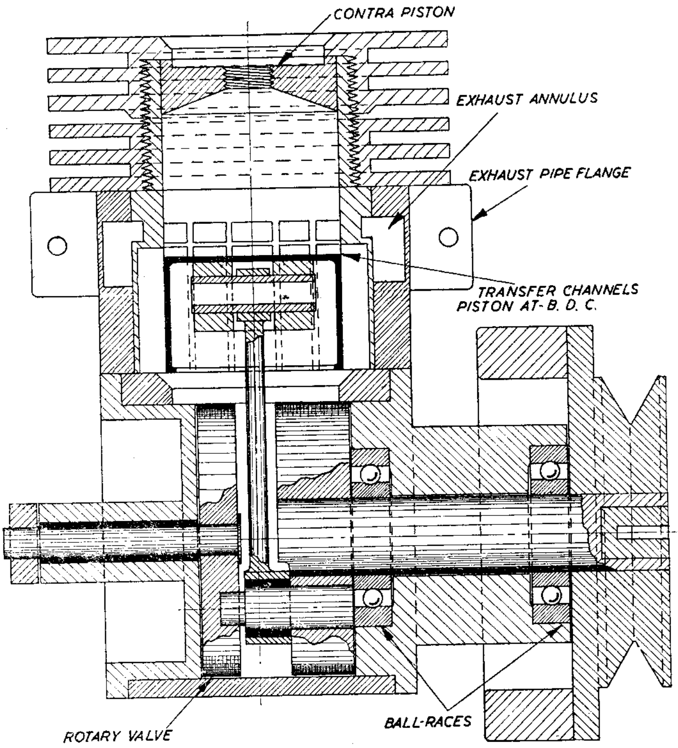
For the benefit of intending constructors a description of the major components, and an indication of the method of construction now follows.

It has not been thought necessary to make complete working drawings since most i.c. engine enthusiasts seem to like incorporating their own modifications when making an engine, and the cross-sectional drawing together with photographs of the engine dismantled should provide sufficient information.

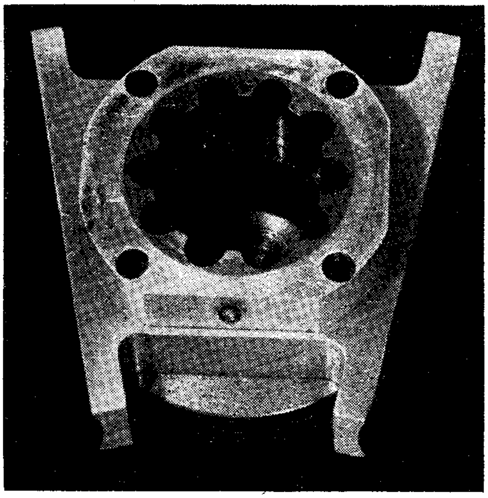
Crankshaft

This item is made from three separate parts. A piece of $\frac{1}{2}$-in. dia. silver-steel $2\frac{3}{4}$ in. long forms the main shaft. This is a press fit in the crank disc. The crank disc is made from cast-steel but a good alternative is a blank cut from a car half-shaft—generally very tough material. Mild-steel may not be used since it tends to release the tightness of the interference fits after a while. After facing the crank disc to $\frac{3}{8}$ in. thick it is bored to 0.499 in. in the centre. This hole must be a good finish, since a poor finish here will result in the reduction of the area of contact in the fit. The crank disc is now set up on the faceplate and the crankpin hole bored at $\frac{7}{16}$ in. throw. The material for the crankpin is a high-tensile steel bolt turned to 9/32 in. dia. and case-hardened. This is press-fitted in the crank disc. Balancing has been the subject of experiment, and the present balance consists of recessing the disc $\frac{1}{16}$ in. deep around the pin to a diameter of 1 in. Two holes either side of the pin are drilled $\frac{7}{16}$ in. dia. and subsequently plugged with light alloy, so that the crankcase volume is not increased unnecessarily.

The part of the crankpin that drives the disc rotary valve is reduced to $\frac{1}{4}$ in. dia. for 3/32 in.



SECTIONAL VIEW OF ENGINE.



The cylinder, seen from underside, showing multiple transfer passages

of its length. Total length of pin, 25/32 in. (including part of pin fitted in crank disc).

The bearing housing is very simple and is turned from dural. An earlier housing having fractured, the present one was left fairly solid. As a matter of fact, this one was made quickly during the regatta season and has not been squared off yet to mate with the sides of the crankcase.

The through hole for the crankshaft is made 0.003 in. oversize, or the crankshaft can be relieved a few thou. This prevents any binding at this point, but greater clearances should be avoided in order that crankcase compression is not lost here. The ball-races are $\frac{1}{2}$ in. bore × $1\frac{1}{8}$ in. × $\frac{1}{4}$ in. uncaged type. Measurements of housings are :—o.d. of flange before squaring off $2\frac{1}{4}$ in., body diameter $1\frac{3}{8}$ in., total length $1\frac{1}{2}$ in. The crankcase is bored $1\frac{13}{16}$ in., so on one side the housing is turned to this diameter for $\frac{1}{4}$ in. of depth, leaving the flange $\frac{1}{8}$ in. thick.

The flywheel is made in two parts—a brass rim $\frac{9}{16}$ in. × $\frac{3}{8}$ in. section and $2\frac{3}{4}$ in. dia. and a dural body which incorporates the vee groove starting pulley.

This rim is secured by six equally-spaced 4-B.A. countersunk screws. Again the fixing is by an interference fit only. The end of the crankshaft is drilled down for about $\frac{3}{8}$ in. and a cross slot made. The flywheel supports this coupling arrangement, as the actual drive, so to speak, comes from inside the flywheel.

(*To be continued*)

TRADE TOPICS

NEW MULTICRAFT KITS

Two new kits of specialised hobby and craft tools have made their appearance on the market. They are the Multicraft " Cadet " and the Multicraft " Major," offered by the manufacturers of the well-known Multicraft Precision Cutter.

Since this knife was first offered on the home market over two years ago, the makers have added a number of useful new blades and accessories. The knife itself is complete with four individually-shaped blades which are safely housed inside the handle. The blades are manufactured from Sheffield carbon steel, and can be constantly ground and honed. Replacements are available cheaply.

The new accessories, which fit into the same knife handle, include a set of three chisels (M.5 $\frac{1}{8}$ in., M.6 $\frac{1}{4}$ in. and M.7 $\frac{3}{8}$ in.), a 2 in. long saw tooth blade (M.8) and a set of three Abrafile round files (M.9 $\frac{1}{8}$ in., M.10 $\frac{3}{16}$ in. and M.11 $\frac{1}{4}$ in.) each 3 in. long. An ingenious new tool has been added in a saw frame which screws into the knife handle after removing the chuck. This comes complete with a standard 6-in. hacksaw blade and a 6 in. Abrafile tension saw blade for cutting wood, metals, ivory, plastics, etc.

The new kits embrace a complete range of tools and blades, with many duplicates. The " Cadet " kit is housed in an attractive plywood case, with a particularly novel and practical method of holding the blades ready for service. The " Major " kit comes in a solid beechwood presentation case, with routed sections to hold all the items.

The same manufacturers are also offering a novel sanding block with continuous sandpaper bands in three grades of grit. The bands are changed, or tightened, by a simple mechanism using a coin, or key, which enables every inch of the bands to be used as they get worn by moving them round the block and re-applying the tension. The shape offers various radii, and a sponge rubber cushioned portion to meet the needs of all classes of work.

Multicraft tools are manufactured by Multicraft Ltd., and exclusively distributed by Phillips Omnipool Ltd., 29, Bolsover Street, London, W.1. (Telephone : MUSeum 5969.)

FOSECO FOUNDRY PRODUCTS

We have recently received from Messrs. Foundry Services Ltd., Long Acre, Nechells, Birmingham, 7, a folder of brochures describing their range of foundry supplies and principle products. The same firm also publish a house journal called *Foundry Practice* which is issued free every second month and is written essentially for the practical foundryman. All genuinely interested readers are advised to write direct to this firm who will be pleased to add their names to their mailing list.

ELECTRIC MOTORS

A very nicely produced catalogue has been received from the Normand Electrical Co. Ltd., listing their range of Neco electric motors, both direct and geared. Each type is well illustrated and their accompanying literature is both adequate and instructive. All interested readers should write direct to Normand Electrical Co. Ltd., North Street, Clapham Common, London S.W.4.

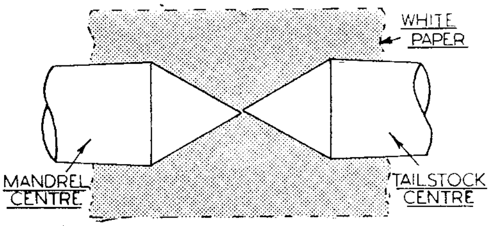


Fig. 1. *Aligning the back centre by eye*

Novices' Corner

Testing and Setting the Tailstock Alignment

THE alignment of the tailstock centre with the headstock requires testing either for checking a lathe of doubtful accuracy or when resetting the tailstock after it has been set over for taper turning.

Any serious lack of alignment can easily be shown up in the way illustrated in Fig. 1. Here, with the lathe turning at moderate speed, the headstock centre is first checked for true running ; all being well, the two centres are next brought close together with the tailstock locked to the lathe bed.

If the points of the two centres are now examined against a piece of white paper, an error of alignment of even a few thousandths of an inch can quite readily be detected, especially if a reading glass is used to give a clearer view. We have known even lathes shown at exhibitions fail to pass this simple test of fundamental accuracy which is essential for all ordinary turning.

This test can be made still more convincing by closing the two centres on a safety-razor blade, as illustrated in Fig. 2. If there is a small error of alignment, the blade will be tipped ; moreover, the direction of the tip will show clearly whether the error is due to the back centre being above or below or to one side of the headstock centre. Where the lack of alignment is greater, it may not be found possible to support the blade at all.

Checking With the Test Indicator

The test indicator is commonly used to demonstrate the true alignment of the tailstock centre with the axis of the lathe mandrel, and to obtain an exact measurement of any error present. For quick and accurate testing, some lathe manufacturers mount a parallel-ground test bar between the lathe centres and then apply the test indicator to both the upper and side surfaces at either end of the bar ; any slight discrepancy between the two sets of readings can then be corrected by hand scraping. However, in the small workshop an alternative form of test can be easily made without the need of special equipment. As shown in Fig. 3, the test indicator is mounted in the headstock chuck and the contact point of the indicator is brought to bear on the parallel portion of the tailstock centre while the tailstock barrel is fully withdrawn and securely clamped. The drawing represents the mounting of the test indicator diagrammatically, but in practice the indicator can be attached to a $\frac{5}{16}$ in. diameter rod by means of its own clamp, and the rod is then gripped in the chuck jaws. This method of mounting will allow the necessary adjustments of the indicator setting to be made. As the mandrel is slowly turned by hand, readings of the indicator are taken on top, below, and at the two sides—a small mirror resting on the lathe bed will enable the indicator to be read when in the bottom position. The test is then repeated with the tailstock barrel extended and again locked.

Comparison of the two sets of readings will at once show if the tailstock centre is truly aligned in both positions. If it is found that the tailstock is set parallel with the lathe axis but to one side, the necessary correction can, of course, be made by setting over the tailstock itself in the direction indicated by the tests.

But if the tailstock lies obliquely to the lathe axis or the centre is found to be above or below this line, then it is best to consult the maker of the lathe. It must be remembered, however, that the tailstock centre is not uncommonly set very slightly above the lathe axis to allow for the necessary correction coming about automatically as wear takes place, but any low positioning

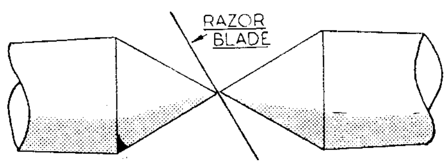


Fig. 2. *Testing the alignment of the centres with a razor blade*

of the back centre is inadmissible and will probably tend to become worse.

Resetting After Taper Turning

Where the lathe is known to be accurately made, there is little difficulty in resetting the tailstock after it has been set over for taper turning, and this can be readily done in the way previously described.

Another simple method is to drill a centre in the end of a short piece of rod gripped in the chuck by using a centre-drill held in the tailstock drill chuck ; before doing this, the tailstock should, of course, be centred as nearly as can be judged by reference to the engraved setting lines on the base of the casting.

The tailstock set-over clamp-screws are again slackened and the tailstock itself is adjusted until the coned centre engages evenly in the drilled centre. Next, the test indicator, mounted on the surface gauge resting on the lathe bed, is applied to the side surface of the rod held in the chuck. If the back centre is now fed into the centre formed in the rod, any movement of the indicator needle will be due to the rod being pulled to one side as the working clearance in the lathe mandrel bearings is taken up. The tail-

A length of round material of, say, $\frac{3}{4}$ in. diameter is accurately centre-drilled and then shouldered at either end.

The shouldered ends are next threaded, and a washer is firmly secured against either shoulder with a nut. The prepared arbor can now be mounted between the lathe centres and is driven by a carrier secured to one end. As before, a light cut is taken over both washers with the same setting of the tool, and the two diameters are then measured with the micrometer to check

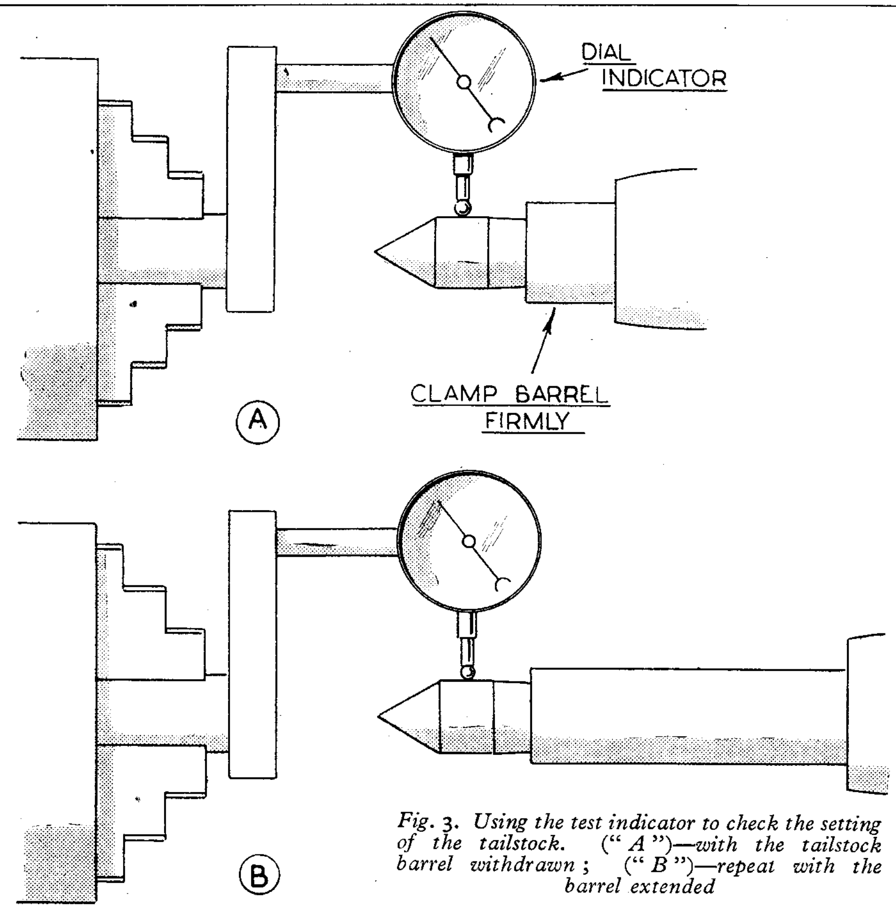


Fig. 3. Using the test indicator to check the setting of the tailstock. ("A")—with the tailstock barrel withdrawn; ("B")—repeat with the barrel extended

stock is then adjusted until engagement of the back centre does not cause any alteration of the indicator reading.

A method of setting the tailstock commonly used is to take a cut, with the same setting of the tool, at either end of a round bar mounted between the lathe centres; the two machined surfaces are then measured with a micrometer, and any variation in diameter will indicate the lack of alignment of the tailstock for parallel turning. Time and material will, however, be saved if, instead of a simple bar, an arbor of the form illustrated in Fig. 4 is used.

the alignment of the tailstock centre. When the washers become too small for further service, they can easily be replaced with but little waste of material.

A job we once undertook for a friend was to scrape in a spare, lever-operated tailstock for a Boley precision lathe; this, of course, called for some care as, when the work was finished, it was essential that the tailstock should be correctly aligned in both planes and should also lie at exactly centre height. The tailstock in question was obtained after delivery of the lathe and the manufacturers, in accordance with the usual

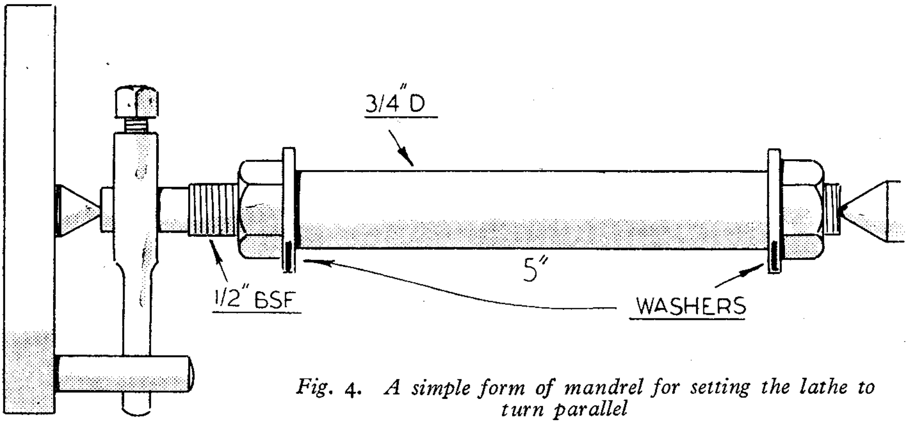
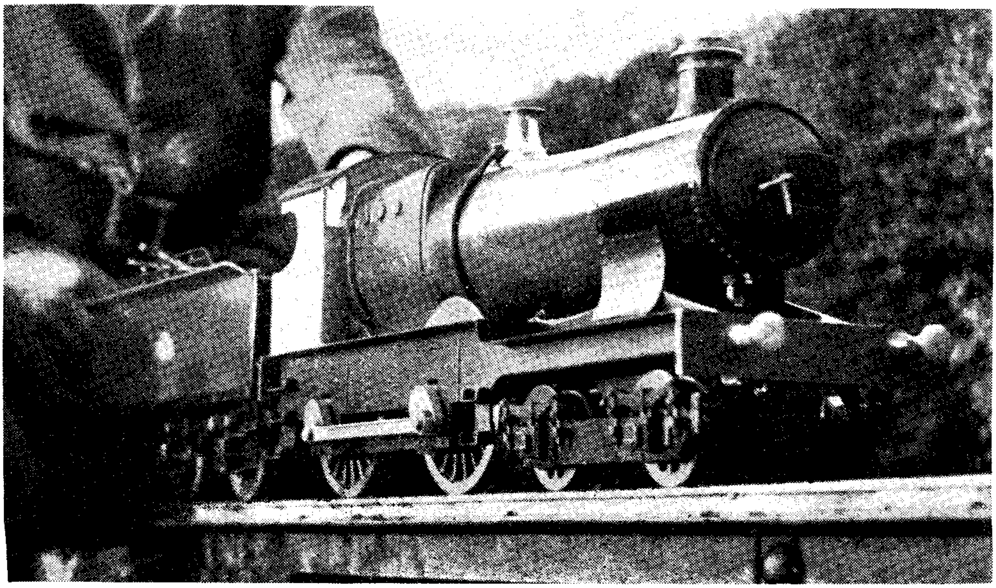


Fig. 4. A simple form of mandrel for setting the lathe to turn parallel

practice, sent it out some 5 thousandths of an inch too high so as to allow an ample margin for hand fitting. During the scraping-in operation, even contact with the bed surface was maintained with the aid of marking compound, and the alignment was constantly checked by the method already described with the test indicator mounted in the headstock chuck. Fortunately, a satisfactory result was obtained, but there was always the danger of scraping off too much in one place and bringing the tailstock below the lathe centre-line; this would have resulted in a badly fitted tailstock and possibly the loss of a very good friend.

A $\frac{3}{4}$-in. Scale G.W.R. "Bulldog"

WE illustrate a partly-finished $\frac{3}{4}$-in. scale replica of a Great Western Railway 4-4-0 locomotive of the "Bulldog" class, which is being constructed by Mr. Kenneth Webber, of Cheddar, Somerset. As will be seen, this model, even in its unfinished state, has caught much of the very distinctive "atmosphere" of the prototype. We understand that it has been steamed and found to be very successful, and we hope, in due course, to publish a description of this very interesting example of miniature locomotive construction when it is finished.



PRACTICAL LETTERS

Workshop Topics

Dear Sir,—This is the first time I have written to you, but I feel I must tell you how much I have appreciated the articles in The Model Engineer recently.

I made the bench countershaft as described by "Duplex" (Model Engineer February 22nd, 1951). I made it the hard way from the solid metal—rough and rusty. The housings for the S.A. ball-bearings were made from solid pieces of 3 in. × 1 in. Studs were made instead of the pivot bolts, and these were drilled to take a grease gun nipple on the outer ends. This countershaft supplied a long felt want. I made a very good job of it although the sawing was a very laborious business. I wish to thank "Duplex" very much for their assistance.

My lathe is a rather old B.G.S.C. 3-in. which cost me £5 when new from a London store. The mandrel runs in the C.I. of the headstock. This lathe has been in use for over 20 years and is still capable of doing good and hard work.

I was interested in the article by L. A. Watson (Model Engineer, April 5th, 1951) on the construction of a tool holder for the M.L.7. He appeared to lead one to believe that this toolholder was his own idea, whereas the old Drummond $3\frac{1}{2}$ in. fitted this type of holder, less the adjusting screw, and I think the "M" type Myford does so today. I believe this holder is a Norman patent. I have several holders taking H.S. bits, round and square, which are set to correct tool height, without packing, *before* fixing to the lathe. One of these is the Parsons tool holder described in The Model Engineer, dated February 14th, 1935. Incidentally, I made one of the Drummond type tool-holders, with adjusting screw, a long time ago, using a $\frac{3}{8}$-in. B.S.F. clamping-bolt with a recess planed across the block to fit the hexagon head and to allow the bolt to be reversed when the block is turned round. This holder takes $\frac{5}{16}$-in. cutters, ground flat on the top side.

Regarding the "Simple Tool Rack for the Lathe," by "Base Circle" (page 493). I consider this would be far simpler to make if the "Slots" were made by tacking strips to the wood with panel pins. Digging out all those slots with a chisel is a sheer waste of time and energy.

I made the "Small Parting Tool" (Model Engineer, May 24th, 1951). This has proved to be a most efficient and useful tool. The "Tool Height Gauge" (L. A. Watson, October 11th, 1951) appears to be a good idea—reminds me of the "Unique" Test Indicator, and I shall probably have a go at this. The "Parting-Off" tool by N-5-West (Model Engineer, July 19th, 1951) is a good idea, although I do not understand the "fluttering" of the cutter he mentioned. Parting tools are notorious for fluttering without any assistance.

I hope I have not been too critical, but I assure you I greatly appreciate your journal, and look forward to Thursday mornings with anticipation. What I would like to see more of is articles on lathes. After all, the lathe is the main tool, but as many manufacturers do not appear at all anxious to advertise them, it would be a great help if you could let us know more about them. Hand-shaping machines also do not get the publicity they deserve. I have a small "Adept" shaper. This I fixed to a block of wood and it is gripped in the vice when in use, and takes up very little space when not in use. These shaping machines are no doubt a good investment. They eliminate a lot of filing, etc., and are particularly useful for planing the ends of bars, etc. when held in the vertical position. As a matter of fact, I have cut 1-in. bars with this little machine.

Yours faithfully,
Leeds W. Kirkham.

Stephenson's "Atlas"

Dear Sir,—On page 714 of The Model Engineer of November 29th last, under the heading "Grantham 1951 Exhibition," reference was made to a model of the Stephenson goods engine *Atlas* and the date of the prototype given as 1842. In his book entitled *The Development of the Locomotive Engine* (1893), Mr. Clement E. Stretton states that this engine was delivered at Leicester on February 8th, 1834. In literature at Liverpool Public Library I have seen a reference to its construction in December 1833. This engine was undoubtedly the forerunner of the British 0-6-0 inside cylinder goods engine and shows the remarkable progress made by Stephenson in the five years that separated its building from that of the *Rocket*. If sufficient data exists concerning the *Atlas* in the Leicester Public Library, I would certainly make a working model of the engine if in the future I am able to avail myself of it.

Yours faithfully,
London, W.5. Eric W. Payter.

Model Field Gun

Dear Sir,—I should like to make a few comments regarding the subject chosen for the cover picture of The Model Engineer for October 4th last.

As far as the photograph can permit, it appears that the workmanship of the model Q.F. 25-pdr. gun is beyond criticism, but to my impression there are several points to criticise in the carriage or trail. Before I go any further: I served one of the old army fitter gun all arms apprenticeships and became essentially a field man until my posting over here landed me with ack-ack guns.

The first thing I noticed was the riveting of the trail; it appears that they (the rivets) are too large, consequently the original number in the prototype are not portrayed in the model. Secondly, the box portion of the trail appears too small, the towing eye too small and also the seat.

Thirdly, the hand-wheels for the traverse and

elevation gears should be 4-spoked with a large dish to them.

The above items are probably of no account to a model which has had to be built from what one can scrounge off a scrap heap, but to an eye trained to find faults on guns, it could not help but be found.

In closing, I will add that I hope my remarks will be taken in good faith, because if the builders of the gun are under the same situation as I am out here with regard to model making materials, a latitude must be allowed.

Yours faithfully,
Egypt. T. F. FELIX-THOMAS.

The "Duplex" Drill-Grinder

DEAR SIR,—I strongly suggest that those interested in drill grinding should spend the few necessary hours this winter in constructing the jig now being described by "Duplex."

I am the happy possessor of THE MODEL ENGINEER from No. 1 to the present issue, and some years back I studied that excellent article by Van Royen and decided to evolve a jig from it; though dissimilar in design from that of "Duplex," it has proved its worth beyond my expectations. Like "Duplex," I found the off-set drill axis angle of 3 deg. 10 min. did not work in practice and made mine 9 deg. If I were constructing another I should certainly reduce the backing-off angle of 13 deg. to not more than 11 deg. for general work, as I find 13 deg. with the normal rate of flute twist causes the rather thin cutting edge to chip and lose its edges quickly, besides having a tendency to grab more when breaking through.

Those who construct the jig and have been used to hand grinding may—if drills are old—find drills ground on jig after advancing say more than quarter-inch in metal tend to bind and squeal. This is entirely due to the length of lips being "dead on" and the lands of drill being worn for a short distance up. Hand grinding usually produces a hole a thousandth or two oversize and therefore the lands which are unworn do not seize, but the jig grinding each lip accurately only looks after the actual part presented to grinding wheel and if it is undersize by wear it grinds to that diameter.

My remedy for this is somewhat drastic; I put it in a vice with, say, a quarter of-an-inch projecting and break same off with a sharp blow from a hammer, rough grind by hand and finish on the jig.

Yours faithfully,
Kings Lynn. JOHN D. ELAM.

Old Boilers

DEAR SIR,—As an ever interested reader for many years of THE MODEL ENGINEER with its many-sided interests and topics and as a boiler surveyor, I had lately known of the final "retirement" of the unusually long-lived 97 years old Lancashire boiler at the Bridge of Weir Leather Co. Ltd. Reading your "Smoke Rings" paragraph and comments on this boiler in the November 8th issue reminded me of what may be an even older working boiler which I examined about 16 years ago, the working pressure being at that time I think 40 lb. per sq. in. and used to steam a small beam engine. It was an early type of externally fired egg-ended "pot" boiler, a type generally in use before the Cornish and Lancashire boilers had appeared, and was an excellent example of the all-hand-constructed boilermaker's skill. The circular shell rings were each built up from either four or five separate wrought-iron plate sections with the old type hammer-formed peerie pointed rivets in the single riveted longitudinal and circular seams, riveting machines and snaps being then unknown. The egg ends were formed from four camber plates lapping on to a centre cap-plate, similar to the present-day Cochran boiler crown plate.

This boiler was steaming at the old Water of Ayr and Tam O'Shanter Hone Stone quarry, some distance inland from the town of Ayr. So far as I can remember, in 1935 the known recorded age of this boiler was 60 odd years and it was known in the memory of old local people to have been in regular use about 80 years, and also to have been working in their predecessors' time. On this only occasion I examined this boiler, I estimated that it would be about 90 years old.

It would be interesting to know if any of your Ayrshire readers could state if this boiler is working today; if so it will by now have exceeded the century mark. At the time I saw it, the only repair on it was a small riveted patch on the underside of the shell over the fire.

It may also interest you to know that there is also an early, I think, Stephenson locomotive working regularly at a quarry in Ayrshire, its maker's number plate indicating that it is 72 years old. I have not personally seen this one.

While in the Midlands, Dudley and Wolverhampton areas years ago, I saw several very old boilers still in use at various works and I would consider some of these would merit consideration for the century mark; that area would probably be the earliest home of the boilermaker's craft.

Yours faithfully,
Milngavie. WM. A. CALDER.

Experiences with the "Busy Bee" Engine

DEAR SIR,—Now that my *Busy Bee* engine is finished and running satisfactorily, I feel that I should write to tell you what an interesting job this has been. It has not yet been put on a cycle, since one is not at the moment available, but its behaviour on test leads me to believe that the performance will be up to standard. It is, incidentally, destined as a wedding present, and is going to a place where it will be the only one of its kind. No snags were encountered in construction, and the only real difficulty was with a badly chilled cylinder flange.

Experience with the engine so far has confirmed a suspicion formed when the Bantamag flywheel magneto was delivered, namely that the dimensions of the taper bore in the flywheel hub are somewhat inadequate. The maximum permissible shaft diameter is $\frac{7}{16}$ in. and the taper is also short, whereas the flywheel is $4\frac{5}{16}$ in. diameter and weighs 2 lb. It can be kept secure when the engine is used as a cyclemotor, but the margin is so small that trouble would

almost certainly occur if the engine was used for, say, driving a lawnmower, and the drive was taken from a pulley bolted to the flywheel. This theory was confirmed when attempts were made to couple up the engine to the S.M.E.E. dynamometer. The flywheel persistently slipped on its shaft under the stress of the drive and it was impossible to take any readings.

The Bantamag is an excellent instrument, but if it was provided with a taper bore of adequate dimensions and had the cam integral with the flywheel it would be a great deal better. Keys could then be dispensed with: Messrs. Villiers, for one, do not use them and in the writer's opinion they are not necessary.

The cutting of the teeth on the driving roller was perhaps the most interesting job, and the methods used were those described by Mr. D. H. Chaddock in his articles on his steam turbine which appeared in THE MODEL ENGINEER early in 1951. I found them easy to use and the results were most satisfactory, the teeth having the correct involute form. A depth of cut of 0.090 in. was found to be about right; in this connection it should be noted that, owing to the variation between the roller diameter and the correct outside diameter of a 18 d.p. 35 T. gear, the teeth are not cut to the full calculated diameter, otherwise they will be pointed. I have all the equipment and I shall be glad to lend it to anyone wishing to borrow it.

The engine is very easy to start and even at the first attempt went off without any trouble. When hot it starts instantly.

In conclusion, I should like to thank Mr. Westbury for a most interesting engine, and to express the hope that in the future there will be more designs for the larger type of engine that can be put to a job of work, together with carburation and ignition equipment for them.

Yours faithfully,

London, W.2. J. F. HICKIE.

CLUB ANNOUNCEMENTS

York City and District Society of Model Engineers

The first meeting in the new year will be held on Saturday, January 5th, in No. 8 room, Co-operative Buildings, Railway Street, York, at 7 p.m. prompt.

On January 19th Mr. Shearman will give his talk on "Drilling Square Holes," a talk which was to have been given during November but had to be cancelled.

Hon. Secretary: W. SHEARMAN, 28, Terry Street, York.

International Radio Controlled Models Society

Birmingham Group. Saturday, January 5th, at 2.30 p.m., at the Birmingham International Centre, 83, Suffolk Street, Birmingham. Talk on the development of a 27 Mc/s transmitter.

London Group. Sunday, January 13th, at 2 p.m., at the Horeshoe Hotel, Tottenham Court Road, London.

Tyneside Group. Saturday, January 26th, at 7.30 p.m., at 176, Westgate Road, Newcastle-on-Tyne. Discussion on transmitter and receiver circuits.

Hon. Secretary: C. H. LINDSEY, 292, Bramhall Lane South, Bramhall, Stockport, Cheshire.

The Inverness and District Society of Model Engineers

At the Highland Hobbies and Handicrafts Exhibition held at Inverness from November 29th to December 1st, this society took a prominent part.

Two stands were allocated for the use of the society and throughout the exhibition, which was seen by almost 5,000 people, they were always surrounded by an interested crowd.

The principal attraction on one stand was Mr. Watt's "OO" gauge Great Western layout, although only partly completed, which was sufficiently advanced to permit both passenger and goods trains to be operated. A number of beautifully finished model yachts were displayed in the centre of this stand, while on the other stand a variety of exhibits ranging from a triple condensing marine engine to a 2 mm. scale wagon on a length of suitable track formed a display of models the like of which had never been seen before in the Highlands.

The first annual general meeting of the society will be held in the Royal Hotel, Inverness, on Monday, January 14th, 1952, at 7.30 p.m., and all interested are invited to attend.

Hon. Secretary: J. KENNEDY, 30, Midmills Road, Inverness.

Edinburgh Society of Model Engineers

Over 30 members and friends visited the Leith Nautical College on the evening of December 12th, and heard a most interesting lecture on "Valves and Valve Gearing," given by Mr. E. H. Brooks, one of our members. Although a very complicated subject, Mr. Brooks managed, in his own inimitable way, to sustain interest, and time passed all too quickly; once again we are in his debt for a most entertaining evening.

Hon. Secretary: JAMES H. FARR, Wardie Garage, Ferry Road, West, Edinburgh, 5. Tel. 84176.

Ickenham and District Society of Model Engineers

A breath of sea air was brought to the society on December 7th by Mr. T. W. Karran of the Kodak Society, who gave a most absorbing lantern lecture on the sailing ship. Mr. Karran's experience of these graceful craft is a long one and from his description of early days, a hard one. Many useful hints and tips were given on various forms of ship construction, and Mr. Karran also brought along one of his own models which will no doubt spur on our marine section to new efforts. The evening was voted as one of the most interesting the society has had, and tribute must be paid to our patient programme secretary.

Further details of the society may be obtained from the Hon Secretary, F. HOUCHIN, 17, Evelyns Close, South Hillingdon, Middx.

The Tees-side Society of Model and Experimental Engineers

On Tuesday evening, December 11th, the society held a "Components in Progress" meeting when members brought along their complete models and their "bits and pieces" for the envy or criticism of their fellow members. Among these was a complete model of an early locomotive, made by a member who was a newcomer to the craft. This model had won a prize at the Newcastle exhibition and was admired by members. Others brought along an assortment, ranging from the camshaft for a four-cylinder internal combustion engine to a twist drill grinder, and all received commendatory remarks and advice where it was required.

Hon. Secretary: J. H. CARTER, 28, East Avenue, Billingham, Co. Durham.

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